

THE MEANING OF SELF-RELIANCE

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THE NEED FOR SELF-RELIANCE*

LAL BAHADUR SHASTRI

THE EVENTS of the past few weeks have roused the entire nation to a new and deeply felt awareness of its responsibilities. Foremost among them is the preservation of our freedom. We were suddenly faced with an unprecedented challenge, but this was met swiftly and effectively. The brave Indian soldier and air man provided the answer. Who were these brave warriors to whom crippling injuries were of no consequence, who courted death with a smile so that India may live with freedom and honour? They were our sons and our brothers.

They have shown the way and we are all so proud of them. But the task is not yet done. In fact this is a task which is continuous and which will always have the first call on our resources and on our lives.

The preservation of freedom is not the task of soldiers alone. The whole nation has to be strong. We all have to work in our respective spheres with the same dedication, the same zeal and the same determination as inspired and motivated the warrior on the battle-front. And this has to be shown not by mere words but by actual deeds.

The one lesson which we all must learn and whose implications we must all accept deep down in our hearts is that for the preservation of freedom we must have the necessary internal strength and that we must be as self-reliant as possible. We have to build up our economy in such a manner as to be self-sufficient in certain essential sectors.

*Broadcasts to the Nation, October 10 and October 19, 1965

So far I have been talking about the need for a determined endeavour to increase substantially the production of food within the country in order to attain self-sufficiency. Obviously, the production of food is not an end in itself. The objective is to feed all the people. We must aim at equitable distribution. Here again, it is the cultivator and the farmer who can be of the greatest help. They have to feed the workers in factories and mines, landless labourers who work for wages, the city-dwellers and, above all, the men of the Armed Forces who are defending our frontiers. My farmer friends, you may certainly keep enough for your requirements. But you must consider it

quick-growing fruit trees like banana and papaya. That has the space for it; and much can also be done in raising kitchen garden should be a matter of pride to every household able should be used for growing vegetables. A well-kept plot of land and every bit of garden that can be made available bit of land should be cultivated. Even in cities, every little with the availability of water and other climatic conditions. Every cereal or oilseed or other useful crop that can grow there in the present emergency every area should try to grow what-

of our high targets. If traditional sources of irrigation are not able to meet the demand of irrigation should be met by digging temporary *kutcha* wells, achieving the goal that we have set before us. The requirements This should not, however, deter us from making brave efforts for. The *rabi* crops are naturally threatened with lack of moisture. This year the rainfall all over the country has been below normal. for the utilisation of full irrigation potential should be taken. the most economic and maximum possible use. Advance action But wherever such facilities are available, they must be put to that all areas have not got the irrigation facilities they require. The success of agriculture depends on irrigation. It is a pity for securing a substantial increase in agricultural production.

Under the existing circumstances, this is absolutely indispensable. resources to increase composting to the maximum extent possible. dung manure. All steps should, therefore, be taken to utilise our higher nitrogen and other nutrient contents than ordinary cow-

I wish to speak to you tonight about the all-important subject of food production. I consider self-sufficiency in food to be no less important than an impregnable defence system for the preservation of our freedom and independence. Our long-term objective must be to achieve self-sufficiency in food, not by self-denial but by producing enough within our country in order to feed and build up a nation which is healthy and strong. Dependence on food imports is not only bad for the economic health of our country but also undermines our self-confidence and self-respect. We have to stand on our own legs and a beginning has got to be made right now towards self-sufficiency in food.

The food front today is almost as vital as the military front. The measure of the present deficit in our food production is provided by the quantum of annual imports. These imports, however, constitute less than eight per cent of the foodgrains that we consume in the country. Surely, it should not be impossible to make good this deficit provided we make an all-out effort. Let us make a beginning straight away. The *rabi* sowing season is upon us, and this is the most crucial period of the agricultural year. On what we are able to do now will rest the fortunes of our country in the coming year. Our aim, our objective, our slogan should be "Two Grains Should Now Grow Where Only One Grew Before".

When it comes to agriculture, my brother cultivators know much more than I do. I shall therefore confine myself only to some general aspects of this matter. Firstly, increase in agricultural production would mean intensive cultivation and raising of more than one crop on a plot of land where only one grew before. If two crops are already being taken, then we must strive for even a third. This is not at all difficult with proper rotation. We must also try wherever possible to grow some minor crop along with the major crop.

As you are aware, our over-all supplies of fertilisers are inadequate. Foreign exchange being so scarce, we would not be able to import enough to meet all our requirements. We, have, therefore, to make good this deficiency by concentrating attention on increased composting. Per unit of material, compost has

your national obligation to make the rest available to accredited agencies. You have already been assured of a fair price. I want to address myself especially to the bigger farmers who are better off and who have some holding capacity. I would ask them earnestly to come forward and help the nation by marketing the entire surplus which they may have. This is the best service they can render to the country in these days of emergency. Withholding of supplies causes distress and this, I am sure, everyone would want to avoid. I would ask all the farmers to adopt the slogan "Produce More and Market More". There should be organisations in every village to enthuse the kisans, and I hope the village panchayats and producers' co-operatives will take the lead in this. In our freedom struggle, the kisans of India played so notable a part. I am confident that they will stand by the country in its present hour of need.

I would also appeal to the traders not to withhold supplies. Above all, they must ensure that the essential food-stuffs are made available to the public at reasonable prices. I am glad that the trading community has tried to keep down the prices and I am hopeful that in these difficult days they will continue to display the same public-spiritedness. A great responsibility devolves on them at this time of emergency.

It is equally necessary that the consumer must not hoard food-grains but purchase only what he needs for his immediate requirements. There is no need for extra purchases. There must be equality of sacrifice and the consumer can help a great deal by exercising self-restraint.

While we are specially thankful to the United States of America and to some other friendly countries for the food which they have been giving us as aid, we must be prepared for a situation when we may not be able to import all that we need. If there is enough food, each one of us will eat adequately. If, on the other hand, there is shortage, each one must be willing cheerfully to make a sacrifice.

While we are trying to step up the production of food within the country, the attainment of self-sufficiency would naturally take some time. In the intervening period, there must be restraint

on consumption. Conspicuous consumption must be strictly avoided not only in respect of cereals but also of other food-stuffs. Parties, dinners and lunches are not in tune with the times at all. At weddings, there should be no exhibition of ostentation. There is no need for many dishes to be served. Hotels and restaurants also have to keep in line with the present-day requirements. Austerity is the need of the hour and it must be encouraged by strong public opinion.

I would like to say a special word about the housewife and the vital role she has to play in the present emergency. Our women can help in inducing a change in the dietary habits of the people by introducing in the family diet items that are grown in the area but are not consumed. We may have our menu partly in wheat and partly in other cereals like maize, barley, bajra or gram. The lady of the house should economise on the consumption of cereals and make a conscious effort to eliminate wastage which unfortunately one does come across even these days. In well-to-do families, where the diet can be supplemented by items like vegetables, fruits, meat, fish and poultry, every effort has to be made to cut down on the consumption of cereals. I wish such families would plan at least some cereal-free meals every week. The women of India have always made their own contribution in the service of the country; let them again take the lead in this vital matter of austerity and conservation of food.

As I said earlier, the next *rabi* season will commence shortly and the coming three or four weeks are, therefore, of great importance. First and foremost, you have to sow all available land and no patch should be regarded as too small for the purpose. For assisting you in every possible way, the whole machinery of the Government is being geared up. I am requesting the Chief Ministers to issue immediate instructions to the District Officers for launching a food production drive within their districts. In this the Community Development Organisation will have to play a vital role. There has to be, and there must be, a well-co-ordinated effort to provide seeds, fertilisers, water and other requirements in the best manner possible. A scheme for the whole district has to be drawn up and groups of villages have to

be entrusted to officials whose responsibility it would be to keep in close and direct touch with the farmers and to do everything possible to resolve their difficulties. The entire team in a district has to work with a sense of dedication in the same manner as a soldier on the battle-front. The District Officer should regard himself in all humility as a commander who has to organise this drive and achieve the target which must be clearly laid down. He should delegate all his routine work to some other senior officer of the district administration, reserving his own attention and energies almost exclusively for work connected with agricultural production. The success of these efforts will not be in doubt if official would apply themselves to the task not merely as a part of their duty but also as a part of the deep obligation which they owe to the country at this critical hour.

We live in fateful times. The dangers that threaten us have not yet passed. In this moment of crisis our jawans have shown the way. Can our kisans lag behind? The jawan is giving his blood, he is staking his life for the country. I am asking the kisans to give their toil and their sweat. Let them also go out in their millions to the fields that are waiting to be sown, and with enthusiasm, endeavour and enterprise make every effort possible to increase the production of food. Whatever may befall, let us so conduct ourselves that even by suffering and by sacrifice we succeed in making this country of ours self-sufficient, self-reliant, self-respecting and strong.

* * * *

DURING THE PAST few days, I have travelled around and visited a number of places. First of all I went to the Forward Areas in the Lahore and Sialkot sectors where I found the jawans of the Army and the Air Force in excellent spirits and fighting fit. In Bombay, Aurangabad and Paithan I saw lakhs and lakhs of people, their faces beaming with a new confidence and their eyes glittering with a new vision. When after the Chinese aggression, three years ago, we started celebrating National Solidarity Day on October 20, we had set ourselves an objective. The country today presents an inspiring picture. The nation's solidarity

has been demonstrated to the whole world. There is a fierce new will to make good in all directions.

We are still in the midst of an emergency and may well have to live with it for quite a time. We must, therefore, take a long-term view of things and look into all aspects.

On the occasion of this year's Solidarity Day, which is to be celebrated tomorrow, let us determine to give practical shape to the keen desire of the people, so evident everywhere, to be self-reliant.

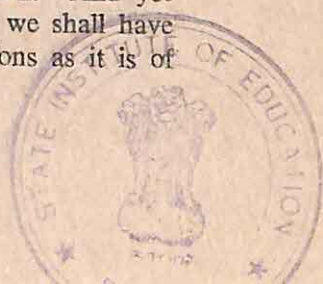
Self-reliance does not mean that we have everything that we need. No country in the world is self-sufficient in all respects. Self-reliance is an attitude of mind. A poor man can be self-reliant, while a wealthy person may be dependent on others. Self-reliance means the capacity to make the utmost of what we have and the courage to do without what we do not and cannot have. There are three specific fields in which self-reliance is of the highest importance. First of all, our armed forces must be adequately equipped to defend our frontiers and to meet the challenges that we face. Our defence industries have, therefore, to be developed further at top speed. Next is the question of self-sufficiency in food. The farmers seem to realise their responsibility and their response is heartening and gratifying.

In the context of the present situation, we will have to do a lot more things ourselves than we have been doing so far.

While we should be grateful to those who extend us a helping hand, we must be ready to stand on our own feet, not in some distant future, but here and now. The question which we must ask ourselves is : what can we do to generate, through our own efforts, the resources we need for our development and defence ?

These resources have to come out of what we produce. A good proportion of it has to be set aside for current consumption. If we want to hasten the attainment of self-reliance, we have, in other words, to produce more and consume less.

I know it is not easy for us whose levels of income are so low to think in terms of cutting down consumption. And yet we have to remember that if we save more today, we shall have more to spend tomorrow. This is as true of nations as it is of



individuals. We have to make a sacrifice in order to give a better life to our children and the future generations in the years to come. We may have, therefore, to deny ourselves many things today. During the last fifteen years, through three Five Year Plans, incomes have been rising and the levels of consumption of food-grains, of sugar, of cloth, of bicycles, of radios and many other things have been going up from year to year. If we want to hasten progress, we have to go slow with increases in consumption. Incomes may rise, but the levels of expenditure have to be kept down.

There are a number of schemes of small savings in existence today. A post office savings bank account can be opened by anyone with as little as two rupees. Sums of ten rupees can be invested in National Savings Certificates which will give you eighteen rupees in ten years' time. Then there are the Twelve-Year National Defence Certificates which have the advantage of giving a very good rate of interest free of tax. In the present emergency, the drive for investment in the Defence Savings Certificates has to be given a fresh momentum. Significant results can be achieved if the requisite effort is made. For instance, the Maharashtra Government has succeeded within a few days in securing an investment of about two crores of rupees, and this is only the beginning. Even people with low incomes can invest in these and help the Defence effort.

We now propose to introduce a new scheme. The Government has decided to issue a National Defence Loan in two series. There will be a seven-year loan which will carry an interest of 4.75 per cent and a three-year loan at an interest of 4.25 per cent. These loans will be available on tap for subscription without limit. Subscriptions can be made in rupees as well as foreign exchange. Non-residents subscribing to the loan in foreign exchange will be granted facilities for the repatriation of the principal and interest which will be free of tax.

In the present crisis, too, people have spontaneously contributed to the National Defence Fund and every day I receive donations, large and small, from all sections of the community, from all parts of the country and even from abroad. I have no doubt

that the new National Defence Loans will get the most enthusiastic response from the people. What I want is that these loans and savings certificates should be subscribed to by each and every one.

What I have said so far relates to internal resources. Even more critical is our shortage of external resources, of what is known as foreign exchange. This is because for both our development and our defence, we have to import a large variety of things which are not being produced in the country. This is perhaps the most serious weakness of all and we have to ask ourselves how we should tackle it. Quite obviously, we have to import less and to export more. We have to make a sustained effort to produce in India what we have been importing from outside and also to find indigenous substitutes for imported articles.

The old gospel of Swadeshi which Gandhiji preached to us is as valid today as it was forty years ago. We must revive the same spirit and generate the same enthusiasm.

While efforts have to be made to reduce imports and stimulate exports, it will take a little time before we can see positive results. Meanwhile, there is one source of foreign exchange in the country itself which, in the present emergency, we must mobilise. I refer to the holdings of gold in the country. People have given of this gold to the National Defence Fund as well as to the Gold Bonds which have been issued in the past. Quite understandably, however, they have been reluctant to part permanently with their gold which, for many, represents the savings of generations. They are anxious to hand over the gold to their children just as they themselves have received it from their parents. In this respect also, a new scheme is being started. A new series of Gold Bonds called the National Defence Gold Bonds will be issued, subscriptions to which will be in gold and Government will return an equivalent quantity of gold of standard purity after fifteen years. During the period that the gold is with Government, an interest of rupees two for every ten grams of gold subscribed will be paid every year. No income-tax will be charged on this nor will the Gold Bonds be subject to Wealth Tax. The Bonds will be transferable and free

from Capital Gains Tax. Certain concessions in respect of Gifts Tax and Estate Duty will also be given. The weights are in terms of gold of standard purity, in terms of which all offers of gold will be assayed and accepted and ultimately returned. No action will be taken against subscribers on the ground that the provisions of the Gold Control Order or the Income-tax Act have been infringed. The identity of the subscriber will not be disclosed.

Here then is an opportunity for everyone who has gold in the country, either in the shape of ornaments or as bullion, to put it to a noble cause, to finance the import of equipment and materials needed for our defence and development without, however, giving up the ownership of gold and the possibility of selling or making a gift of it at one's discretion. What is more, this gold will start earning a return.

There is another source of foreign exchange which should be harnessed in the present emergency. Indians living abroad can be of much help to the country. I know the same feelings throb in their hearts, as in ours. In fact their feelings may be more intense as they are away from their motherland. Whether they have permanently migrated or are temporarily out of India, they often send remittances to their relations and dependants in this country. There has been a tendency for these remittances to be diverted to unofficial channels which are more profitable. When the country is facing a major crisis, I would like to appeal to all Indians abroad to send whatever money they do through official channels alone. It has been decided to introduce a scheme under which Indian nationals receiving certain kinds of remittances from abroad through normal banking channels will be granted import licences to the extent of sixty per cent of the value of the remittances. These remittances are free of Indian taxes. Indian residents holding foreign exchange abroad with the approval of the Reserve Bank would also get the benefit of import licences under this scheme if they bring such money back to India. These import licences would be valid for the import of certain approved commodities, particularly raw materials in

short supply and capital equipment needed for stepping up production in the country.

Formal announcements giving details of the various schemes to which I have referred are being made separately by the Ministry of Finance. These matters, however, are not purely financial. The money, the foreign exchange and the gold are all needed to strengthen the country. Let every man contribute according to his means, the utmost that he can in the knowledge that by doing so he will make the nation self-reliant.

My countrymen, we must take time by the forelock and try unitedly to push the country forward towards self-reliance and growth. We as a country are endowed with rich natural resources and we should also have the will and the determination to apply ourselves. Let us then join the crusade and success will not elude us.

A NATION DONS THE ARMOUR

ASOKA MEHTA

DEFENCE MUST HAVE the top priority in all our efforts and in all our resources.

When a nation dons the armour, when its manhood is challenged, it is not enough for the fighting forces to put forward their best, it is necessary for the people as a whole to share the incandescence of common purpose and function in unison and concord. That involves more than rephasing of Plan priorities; it means social solidarity with accent on equality.

The needs of defence increase vastly if the nation has to face a prolonged shooting war. Where an uneasy truce exists, the defence preparations have to be kept at the stage where active hostilities can be promptly met.

The limitations on our preparations can come from foreign exchange, from scarce materials, from scarce trained personnel. There need be no limitation from other resources, such as availability of rupee finance or general labour supply.

While in the short run the scarce resources in men and materials have to be met by greater deployment of them for defence needs from civilian use, in the main we must overcome the scarcities by accelerated programmes of production and training. The persistent scarcity will be of foreign exchange, particularly because we have normally been depending on considerable external assistance.

Foreign exchange resources can be augmented by a determined drive to push up exports. That would involve attention to quality of production, the requirements of external markets, and rigid restriction on internal consumption where exports are possi-

ble. Till now we have been functioning in almost the opposite manner.

The other way is of reducing pressure on foreign exchange by undertaking in a bigger and meaningful manner import substitution. We have recently increased the customs duties, and it will be necessary to exercise rigid control on imports. Through ingenuity and innovations we must strive to substitute with indigenous production what we have been accustomed to rely for on imports. Here is a challenge to our industrialists, scientists, technicians and engineers.

We are considerably dependent on external supplies for a variety of spares, components and equipment for continuing the production capacities we have built up. They account for imports of Rs. 200 to Rs. 300 crore a year. Through effective designing and engineering it should be possible to reduce these imports. That of course would require, first, adequate capacity of foundry, forging and machining, and, secondly, larger supplies of special steels, alloy and tool steels. Their production programme has to be pushed forward and accelerated with determination. Our steel plants, with some ingenuity, can provide the critical needs even now. Then there will be the widening needs of non-ferrous metals. We must observe the strict priorities in use here. But that is not enough. It is necessary to launch a sustained drive for collecting non-ferrous metals tied up in domestic uses and refine them for critical defence and industrial uses.

The Fourth Plan has been drawn up to improve our self-reliance in economic life and, therefore, in defence. These programmes have to be pushed forward with determination. Their foreign exchange needs, where inescapable, have to be found after the urgent defence needs. So high must be their priority. They are the industries that provide the widening base for both our development and defence. It would be unwise to counterpoise defence and development—they in fact reinforce each other in many areas and activities.

We have so far failed to bring into purposeful communion and co-operation our scientists, designers, engineers and technicians. To achieve that co-operation is among the *sine qua non*

of defence preparedness. The old habits of viewing things from the angle of one's limited speciality, or judging a man's worth by the economic rewards he can claim, must give place to a common focus of efforts and dedication. While institutional devices to these ends are important, emotional adjustments are even more important.

In agriculture, we have to work for self-sufficiency in food and fibres. Full utilisation of irrigation is obvious; so must there be multiple cropping and attention to quick maturing crops. Potatoes and other tubers that give more yield per acre but demand more care in cultivation have to be given urgent attention. As we are unlikely to have all the chemical fertilisers we need, the drive for composts and organic manure has to be stepped up decisively.

There will be increased demands on our financial resources for defence. To meet them, should we cut down our educational or health programmes? I do not think so. We should meet the basic needs of all our people. That is necessary to maintain the nation-wide support for our defence. Non-basic demands of the better-off must be postponed. There has to be a sharp rise in savings and even in taxes. The jawans cannot give their lives while we hesitate to give up our comforts and luxuries.

Why should education be cut down and thereby deprive our rising generation of essential intellectual equipment and opportunities? The barriers to efforts could be materials and trained men. Both can be increased over time but not immediately. Public finance can be so organised that it does not impose a third limitation. If teachers are available, why keep them unemployed and our children illiterate? Such an approach has little in common with defence orientation.

The effective use of our manpower for soil conservation, afforestation, minor irrigation and road construction should be a part of the general effort at mobilising our people. To allow human and material resources to remain unused because we cannot work out the necessary fiscal discipline is to exhibit gross weakness. The solidarity among the people and the upsurge of understanding and agreement among the political parties provide

the opportunity to improve organisational efforts and push forward for fuller use of our idle manpower and neglected resources in soil, water, etc.

The distributive trade will have to show social discipline it has not cared to develop in the past. While State intervention in key areas will have to increase and co-operative efforts to be strengthened, the distributive trade can vindicate itself if it organises itself for self-discipline. Its organisations can seek authority to make their members conform to social discipline and standards. Self-administration in trade can develop if the common objectives are recognised and worked for.

There is the need for neighbourhood groups in towns and cities and *gaon* groups in villages. The needs of civil defence, of vigilance, of sharing limited supplies, of regular collections for defence, etc., would require such organisational effort. These community groups can spearhead production drives as well as look after the urgent needs of their members through better organised distribution. There are untapped resources of leadership in our country. They need to emerge and make these community groups the principal source of mobilisation of people and resources. The pride of democracy lies in combining spontaneity with discipline.

Modern defence is deeply embedded in civilian life. A large complex of economic and social efforts is needed to sustain the fire-power of the jawans. These brave men can fight with undivided minds when they know that their homes are secure and their families and their neighbours all over the country are cared for. When enemies press from many sides and the frontiers are far flung, any part of the country can become the battle-field. The organised preparedness, seeking its daily discipline in productive and community work, has to be maintained all over the country, because none can say who will be in the line of fire, and we are determined that nowhere shall we flinch or falter.

Defence preparation is not just conceding the claims of defence; it is to accept and assimilate some of the discipline and dedication of the jawans. When the defence forces and the people

get closely related together, the jawans cherish the affectionate support of the people, and the people partake of some of the disciplined functioning of the armed forces. One-way defence orientation will in effect weaken our defences. Defence, in the world of today, demands, let me repeat, the donning of armour by the whole nation.

MEANING OF SELF-RELIANCE

B. R. BHAGAT

THE INK WAS hardly dry on the Memorandum on the Fourth Five Year Plan which was considered by the National Development Council recently when the country was faced with one of the biggest challenges since Independence. The National Development Council rightly resolved that the Fourth Five Year Plan must be adapted and reoriented to meet the requirements of defence. This will mean suitable adjustments in priority for individual projects. Some of the less vital programmes may well have to be deferred. Within each project, a great deal of thought and attention will have to be given to methods of reducing its cost and its foreign exchange content. A new exercise will also be necessary to produce an over-all balance of supply and demand in the interest of maintaining price stability. The Planning Commission and the concerned Departments of the Government are now engaged in working out what amounts to a new outline of a Fourth Five Year Plan.

The basic premise of our planning now has to be a quick and determined move towards self-reliance. Even as it is, our plans of development stressed the objective of attaining self-sustaining growth in a not-too-distant future. This objective will now have to be realised as quickly as possible. Economic development in India since Independence has taken place within an environment of peace and security of our borders. We have been able, therefore, to undertake plans of development which involved considerable dependence on imported equipment and supplies, a part of which was financed by generous foreign assistance. Our strategy of development has been to secure the maximum

possible growth in those sectors of the economy which enable us to reduce our dependence on foreign aid over time. This strategy has clearly paid good dividends. Today India has a nucleus of heavy engineering and chemical industries and a rapidly growing metal industry. We are on the threshold of new avenues of development in more sophisticated fields like petrochemicals and electronics. These achievements have been made possible by our own efforts as also by the help of friendly foreign countries and international institutions. We have accepted economic aid without any strings, since our basic policy has been one of non-alignment. We are determined to pursue the same policy for future.

In the changed context, however, we must recognise the realities of the international situation and prepare ourselves to face the possibility of our having to do without substantial economic aid from abroad. The strategy of development which we have adopted so far will, therefore, need to be altered.

The import of capital equipment and certain key raw materials will no doubt have to continue. In a complex modern industrial society, no country can be self-reliant in the sense of being completely self-sufficient. The point is that we must develop adequate export capability to be able to meet all our import requirements from our own resources. We cannot clearly do this if we have to continue to import food in addition to machinery and raw materials. The development of agriculture to its full potentialities must, therefore, receive the highest priority, next only to defence in all our plans for future.

For the last decade or so, we have been importing food-grains on a substantial scale; in particular, during the last three years imports assumed a large dimension. Nearly one-third of the total supply of wheat comes from abroad, most of it under the P.L. 480 assistance programme. Imports of wheat last year were nearly twice as large as the marketable surplus from indigenous production. In other words, nearly two-thirds of the supply in the urban areas was from imported wheat. This degree of dependence for a basic necessity of life cannot be allowed to continue in the present context.

Happily, our dependence on imports is not as great as it appears at first sight. Taking the supply of food-grains as a whole, we import between 6 to 7 million tonnes out of a total supply of about 87 million tonnes. With a marginal increase in production and a firm and equitable system of distribution, we should be able to manage with what we produce. The utmost discipline in the matter of food is necessary. A national food policy which aims at remunerative prices for the farmer and common sharing of scarcity must be put into effect forthwith. We have already fixed remunerative prices for all important crops and it is the duty of the farmer to market as much of his produce as he can after providing for his own needs. Procurement on Government account will have to be increased substantially during the coming season so as to enable Government to secure a commanding position in the food-grains market. We had considerable success in the matter of procurement this year; nearly a quarter of the marketable surplus in rice was procured by Central and State Governments. With effort and co-operation on the part of State Governments, it should not be difficult to increase this proportion. Traders must also co-operate with Government in this hour of crisis; those who do not should be firmly dealt with. In short, the food policy has now to move fast in the direction of socialisation of distribution.

In the industrial field also dependence on imports can be reduced substantially, if only a determined effort was made. There is no need to underrate the role of foreign assistance in our economic development or indeed in the economic development of the developing countries at large. It nevertheless remains true that one of the less desirable aspects of economic aid is to stultify local initiative and enterprise. No one could foresee the phenomenal growth which has taken place in the manufacture of machinery of all kinds since Independence. This has been made possible because of the conscious Government policy to encourage production of machinery. A similar, and perhaps more strident, advance is necessary in the development of local substitutes for industrial raw materials which continue to be imported at present. Already we have made considerable progress in the

direction of import substitution. Copper, for instance, is being replaced by aluminium to the extent possible; the phased programme of manufacturing in various engineering industries ensures that a steadily rising proportion of the total output is manufactured within the country. In the present context, all these efforts must be given a renewed emphasis. More important still is the need to concentrate attention on those materials which are in critically short supply and to develop indigenous production of these or of local substitutes.

In several industries, the growth of output is hampered by our dependence on a few components and materials which constitute a relatively small proportion of the total value of output in these industries; they are nevertheless of such importance that unless we muster all the skill at our command to produce these items at home, industrial output would be affected. This is true also of defence production.

Government has encouraged the development of research laboratories and increasing use must be made of these laboratories in establishing production within the country of critically short materials. Industrial units in both public and private sectors must use the facilities of the national laboratories which, in turn, must be reoriented to meet their needs. They should also establish new research centres of their own. All large public sector undertakings should set up their own research and design divisions and the practice must also be followed by large private units. Industry in developed countries like the United States spends a large proportion of its resources on research. This is a tradition worth emulating. Indian industry must now become increasingly research-oriented. Self-reliance is not merely a matter of preparing estimates or calculating targets. It is a matter of innovation and improvisation; above all, it is an attitude of mind which has to pervade all our activities, whether in agriculture, industry, education or other social services.

The country has made a tremendous effort over the last few years in mobilising sources for defence and development. Further efforts will be necessary to check the growth in private and public consumption (other than defence). Self-reliance, it must

be recognised, is not possible without self-denial. This is obvious in the case of those commodities, like food, which are in short supply. We cannot hope to meet the requirements of defence from our own production unless civil consumption is restrained. But this is true not merely of food. The diversion of resources to defence and development requires a general restraint on consumption. Self-reliance, without complete self-sufficiency, implies the creation of a large and growing exportable surplus. We have to learn to do with less of the things which are not in short supply, so that we may export them and earn the precious foreign exchange needed to import things we cannot produce.

Our objective is not merely to increase the production of military hardware but also to gain greater economic strength to withstand international pressures on us. It is incumbent upon us, therefore, to work with greater purpose and resourcefulness in all spheres of activity. The tasks have to be defined clearly in each field and must be fulfilled, come what may. All our efforts must be given the requisite institutional shape—from top to bottom. The country has got to be welded into a smooth and efficient machine functioning for the attainment of desired objectives. This will call for a quality of leadership at all levels far exceeding that we have been able to muster so far. The psychological upsurge which is evident throughout the nation today has got to be maintained and channelled into a well-defined course of action. In its new-found self-confidence, this nation of 470 million must move forward towards self-reliance and recognise no obstacles in its way.

PLANNING FOR A SELF-RELIANT DEMOCRACY

TARLOK SINGH

THE PRESENT EMERGENCY takes us back to some of the fundamental premises of economic and social development and gives to them a new sharpness and urgency. In a matter of weeks, the wider context in which a country lives and works can change radically. A national crisis throws up new problems; it also brings forth new possibilities and new opportunities which can do much to increase the capacity of the people to bear greater responsibilities and labour together for larger goals.

Self-reliance has been a basic objective of India's planning for about a decade. Progress in this direction, though steady and well-marked, has not been conclusive enough. Rising demand for non-project imports for procuring components and raw materials, pressure on the part of much Indian enterprise for collaborations, frequent resort to foreign consultants for design and other know-how and the inadequate measure in which India's own scientists and technologists have been pressed to find immediate, practical answers to unresolved problems are illustrations of a gap which has been allowed to persist. Yet, through the very processes which have been under way, facilities and talents are at hand for reducing this gap and even eliminating it through intensive and purposeful effort over a short period of years.

The emergency now upon us, while changing the character and purpose of planning, also enlarges its scope and role in our national life. Hitherto, we have tended to think of plans as being spread in terms of a year or five years or longer periods. Plans covered wide ground, their special feature being increasing com-

prehensiveness in the economic and social fields. The objectives were defined broadly rather than pointedly. Time dimensions were not precise enough and if those concerned took longer to execute the tasks entrusted to them, explanations were given and accepted readily. Planning has now to become wholly problem- and task-oriented. The emergency marks out the more from the less essential. It demands concentration of effort and resources. Failures cannot be excused. Explanations cease to be relevant. Performance becomes the single test to be applied. Resources strictly follow priorities. Planning assumes all the characteristics of a military operation designed to succeed—precision in objectives and targets, well thought out strategy and tactics, an assured line of supply, co-ordination in action, command and responsibility, and bold initiative in the field.

In any modern country, there is close interdependence between the quality and range of the defence effort and the strength of the economic and industrial base. The economy supports defence; defence guides and stimulates the economy. This interdependence is as good as the planning that lies behind it. There has to be co-ordination between defence and economic planning in considerable depth, continuous and sustained, followed through every branch of activity in all its intricate detail. A major lesson of the national emergency of 1962 has been impressed upon us once again, with even greater force. Economic planning must comprehend the entire national effort, including defence and the needs of defence, both immediate and long-term, in all their varied aspects. Short of this, defence receives much less support from the economy than it has a right to, planning contributes much less to national security than it can. Fortunately, India's economy has now reached the stage when such co-ordination can bring the maximum benefit both to defence and to economic development.

Self-reliance for defence and development is not to be confused with autarky or with the approach of isolation. Its essential purpose is to put the indigenous resources, capacities, expertise and institutions to the maximum advantage and to achieve a high degree of initiative and autonomy of action in vital

sectors of national life. In pursuing a policy of self-reliance in her development, it would be necessary for India to work for wider and more intimate relations with a large number of countries and, as far as possible, to strive for continuing two-way partnerships. Along with economic bonds, cultural and other links will have to be equally fostered. To the extent to which, for a period, the flow of capital resources and know-how has to be in larger measure from the developed to the less developed nations, international and multilateral arrangements would merit special support. Such reorientation should lead eventually to greater balance and diversification in relation to other countries as well as to a more purposeful advance within the economy.

A self-reliant economy has to be viewed as a major aspect of a larger objective—the building up of a self-reliant, technologically progressive socialist democracy. In recent years the concern for economic advance and the role assigned in it to economic aid and private foreign investment have tended to push back some of the broader social and economic aims and institutional changes which are an essential ingredient of India's scheme of development. The technological aspects of a policy of self-reliance are undoubtedly of great importance, but such a policy has to be pursued continuously over years and must involve some degree of hardship and deprivation and deferment of benefits for all sections of the community. Therefore, its real strength will lie in the degree of mass support and mass satisfaction which can be generated while specific economic objectives are being pursued. The struggle for self-reliance will be a long-drawn one, involving years of effort and acceptance of stern ways of living. It has, therefore, to assume the shape of a national movement from which no one can stand aside and which encompasses every facet of life and activity. The springs of action and the ultimate sanctions of such an all-embracing effort must lie deep within the soul of the people, giving to each individual and each group the sense of sharing in a common endeavour.

Of the several lines along which action should proceed, changes in administration and in the style of work come first. These become a pre-condition for securing greater participation and

response from the people. Each point in the administration has to be enabled to carry a greater load of decision-making and responsibility for action. The main task of the higher levels of administration is to provide clear direction, ensure the essential resources needed, fix responsibility and insist upon results. In time, larger changes of a structural nature will also be required but, for the present, there has to be concentration on increasing the capability of each organisation and, within it, of each individual to act to the maximum extent on their own initiative. No unit within the administration can do much without co-operation and team work from other units. These processes must be so organised that behind each specific task it is possible to identify an individual who has the necessary authority and can be held accountable. One of the first tests of the approach of self-reliance should, therefore, be the conferment of larger powers and responsibilities within the structure, reduction of references and consultations and greater emphasis on drive and decision. For large numbers of individuals engaged in implementing the present plans, the reorientation demanded by the new circumstances of the country involves intensification and speeding up rather than a basic change in the tasks to be accomplished.

Closely connected with administration is the larger role of non-official leaders at every level. In recent years, although new institutions for providing opportunities to non-official workers have grown through Panchayati Raj, co-operatives and other agencies, reliance on the machinery of administration has also increased. In consequence, contacts between non-official workers in different walks of life and the mass of the people have tended to become more formal and functional and therefore less intimate. This has reduced the ability of non-official workers to influence and motivate the mass of the people. The potential of leadership available at the local level, both in urban and in rural areas, and through institutions such as trade unions and co-operatives, is still very considerable. The policy of self-reliance has to be fully understood by non-official workers closest to the people. Only then will they be able to help translate it into practical action

and assist groups of citizens such as peasants, workers and others to assume greater responsibility.

The concept of self-reliance implies that the greatest possible effort that can be physically made at each level will be forthcoming, the next level above being asked to provide only the minimum assistance and support needed. This notion has to be applied within every village and neighbourhood and progressively thereafter to the larger entities of which they form part, such as block, district, city, State and so on. It is through such self-reliance, organised by local leaders working in partnership with the administration that it will become possible to ensure that every citizen has a task cut out for him, a duty to render, a defined role in the large national effort. Once the scope of the idea of self-reliance is understood, the media of mass communication assume critical importance. In this respect the traditional thinking and practice will not be equal to the challenge without a great deal of new effort. Resources on a large scale will have to be made available for reaching the people in every possible way.

The considerations stressed above are, in a sense, of a preliminary nature, setting certain essential conditions for achieving self-reliance. The crux of the economic problem turns on availability of foreign exchange, of scarce materials, of needed capacities and of food and other consumer goods. At the very least, whatever turn events may take, the foreign exchange assumptions on which planning has been based in recent years will change in a fundamental sense. The objectives of industrial production must be redefined as clearly as possible, so that the available capacities may be put to the best use. Given these objectives and the selective approach implicit in them, the key to action is given by these four words: Improvise, Adapt, Substitute, Conserve. It is in this context that scientists and technologists engaged in industry, in research institutions and in universities have to be drawn in a meaningful and rewarding way into the national effort. Ways have to be found for giving to many thousands of them working in teams specific problems to solve. Tasks facing each industry and each branch of the economy have to be broken

down, the existing knowledge and resources assessed and, in accordance with clear schemes of priorities, all the available talent put to work. The truth is that there is even now an extraordinarily large unused or partially used reservoir of ability and knowledge in the country. To the extent this reservoir is drawn upon effectively, it will grow and add to national wealth. This is also a time to consider calling back to India many of the scientists, technologists and other specialists who are still serving abroad. They should be offered worthwhile opportunities to work in vital tasks at home. This thought has come up from time to time, but there is need for a new approach and one supported by the necessary organisation and flexibility in administrative and financial procedures.

Along with measures to reduce dependence on foreign exchange resources, we have to face up to the most urgent task of all—increasing food and agricultural production and so managing the country's food economy that imports play no more than a marginal role. Whether or not continued dependence on food imports has come in the way of the maximum effort being made to increase agricultural production, the opposite may still be true, namely, that to know that we cannot count on food imports to a significant extent should induce the greatest effort physically possible being made in every nook and corner of the land to achieve food self-sufficiency. There may still be a food gap, but through rationing and other means the shortage may be so shared as to enable the country to go through the difficult period unscathed. The successful management of the food economy becomes something more than a matter of marketing, prices, regulation and control. Producers, traders, consumers and the various administrative agencies become jointly responsible in fulfilling their social and economic obligations with complete responsibility to the community. This is itself a good instance of the kind of combination of administrative and popular leadership and mass communication and mass organisation and harnessing of local resources which is essential for achieving self-reliance both in different sectors of the economy and at different levels of national life.

The same combination is called for in dealing with the problem of civil supplies and essential consumer goods. Here, it is equally important that consumption patterns should be reoriented so as to secure to the mass of the people their most essential needs, cutting out demands on scarce materials and vital fabricating capacities for which there are more urgent uses. Restraint in consumption is no less necessary for mobilising resources to sustain the burdens of defence and development.

These burdens are likely to be far bigger than we know or can readily envisage. The management of a mixed economy under the double strain of defence and development is an extremely complex undertaking and one entailing many risks. Here it may be enough to refer to only one of its important components, the mobilisation of savings. The intensification of the savings movement in all its aspects is a task that cannot wait.

Planning for a self-reliant democracy is a total effort. Economic problems are undoubtedly the most important, but they may prove overwhelming unless urgent social problems also receive equal attention at the same time. In working for self-reliance, a nation such as ours seeks to liberate itself both from external limitations and from weaknesses and failures that lie within. We have yet to redeem the promise of freedom for large numbers of our people. For millions the content of freedom is still meagre. To create enough work, to use our manpower resources in a gainful and productive manner, to extend the principle of social responsibility to the relief of distress and suffering within the community, and to implement completely our programmes of land reform and social justice are tasks wholly within the capacity of a nation such as ours.

ECONOMIC PERSPECTIVE OF SELF-RELIANCE

K. N. RAJ

THE EVENTS following the outbreak of hostilities with Pakistan have been from one point of view a blessing in disguise. They have brought home to most people the essential correctness of the attention given to the development of heavy industry in Indian planning. Pakistan's inability to use effectively the sophisticated equipment it received from the United States and its embarrassment when supplies were cut off have also helped to destroy the belief that alliances offer a convenient short-cut for strengthening the defence potential of countries which are themselves economically under-developed.

The ability to manufacture military hardware is, however, only one aspect of the defence potential of a country. It leaves open other possibilities of arm-twisting, such as the thinly disguised pressure now being applied by the United States on India by placing the supplies of food-grain under P.L. 480 on a month-to-month basis. What is gained by use of military force can be easily lost if there is no way of withstanding pressures of this kind.

It would be therefore a serious mistake if the response to recent events takes the form of only an increase in defence expenditure and "defence orientation" is taken to mean simply greater self-sufficiency in the manufacture of military equipment. Indeed if this is all that is done, without correspondingly greater attention being given to strengthening of the economy as a whole, the net effect might be to make ourselves more vulnerable to external pressure than before.

We face here in the immediate future rather difficult choices. Some increase in defence expenditure and in the investment in defence production is obviously inescapable; but if we divert resources for these purposes to the full extent considered necessary on purely military criteria, there is a serious danger of retarding the growth of the economy in precisely the sectors which could make a great deal of difference to its ability to be self-reliant in the course of the next decade or so. We have to be therefore careful about the decisions we take now, particularly if they are of a kind that would make a significant difference to the country's development prospects.

These decisions must, in the ultimate analysis, turn on judgements of a political character, but even political judgements in matters of this kind should be based on an assessment of the relevant economic considerations. Thus, however aggressive the intentions of China and Pakistan might be towards India, their ability to involve themselves in a large-scale military conflict would depend very much on their economic strength. So are there economic constraints on what India can and cannot do in the near future.

Clearly, on the political plane, what is at issue in the conflict between India and Pakistan is not simply the territory of Kashmir. From one point of view—and this is what the two parties directly involved are most concerned with—the dispute is over the basis of partition of the sub-continent in 1947, more specifically on the question whether religion should or should not form the basis of political affiliation. For the rest of the world, however, this question is in itself of very little interest. What concerns most other countries is really the balance of power in South Asia, and naturally the attitude taken by them to the dispute depends on what appears to each its own interest in the region.

From the political angle, therefore, what we choose to mean by self-reliance in the present context and what we decide to do in pursuance of it would depend to a large extent on our own attitude to these issues. If it were simply a matter of preventing Pakistan from resorting to force to upset such political equilibrium

as has been achieved in India in the last 18 years, the task would be a relatively simple one. In fact our present economic and military strength should be very nearly adequate for this purpose (as has been already demonstrated to some extent). But since the dispute with Pakistan is tied up with the larger question of the balance of power in this region, and there are important conflicts of interest which determine the alignments on this dispute, it is necessary to think of self-reliance in a much wider framework than of the conflict with Pakistan.

Much depends here on how immediate and serious we consider the Chinese threat to India to be and what we think are the alternatives open to us in countering this threat. If we believe that the threat is essentially of a military kind and that it might take the form of a major intervention in the near future, there would be a great deal to be said for diverting resources on an extensive scale to strengthening our defences even at the expense of the country's long-term development prospects. If on the other hand we have good reason to think that it is not the immediate military threat that is serious but the prospect of a much more economically and militarily powerful China in the future, such diversion of resources now for defence would be a grave mistake.

The military threat from China has been generally over-rated in India since the invasion of 1962. China's economic potential is not much greater than that of India and, though its political and military organisation makes it possible for this potential to be made more effective use of for defence and related purposes, it is hardly adequate for mounting a large-scale attack on India. China's food-grain output has risen less than India's in the last 12 years; its output of steel appears to be still around the level of 8-10 million tons touched in 1959 and which India will be reaching very shortly; its export earnings are not only no greater than India's but nearly a fourth of its annual earnings has had to be spent in recent years for importing food-grain and it faces therefore a much more serious 'maintenance-imports' problem than India. Very much stronger evidence of China's ability to sustain a large-scale military effort in this region (as distinguished

from limited border incidents for keeping up political tension and tying down our military forces) should be forthcoming before India decides to invest a larger proportion of its national income for an immediate build-up of its defences against China.

It is significant that recent official pronouncements from China have been emphasising that it will take "at least 20 to 30 years" to build up the Chinese economy. There is no reason to think that this is meant to mislead others or that it is in any sense an exaggeration. Indeed such information as is available on Chinese economic strategy suggests that the objective is to achieve self-reliance over a period of time rather than to achieve sensational results in the short period or to prepare the economy for a major military confrontation in the near future. (Its investment in fancy show-piece projects, such as on atom-bomb manufacture, appears to be meant in part as a symbol of the self-reliance it aims at and in part as a cover for its inability to back up its aggressive political postures with strong military action.)

Thus the only sector in which the Chinese economy has leapt forward since 1959, and to which it is apparently still diverting resources at the expense of other important sectors, is machine-building. Before 1959, machine-building in China was confined (as it is largely the case even now in India) to producing fairly simple medium-sized equipment. Today Chinese-built machinery is in service in several branches of heavy industry, such as chemical fertiliser plants, electric generating stations, tractor plants and machine-manufacturing plants themselves. Chinese machine-building industry is now able to produce complete sets of oil-refining equipment and steel-rolling machines. A few months ago, China set up a domestically manufactured hydraulic forging press capable of forging 200-300 ton steel ingots into heavy machinery parts; there are only 20 similar forging presses in the world, and only four countries (U.S.A., U.K., West Germany and Czechoslovakia) have so far manufactured them. There is little doubt therefore that China has already achieved considerable skill and sophistication in this key sector of industry.

The machine-building sector adds to both the economic and defence potential of a country. It makes it possible to manufac-

ture domestically most of the machinery and equipment necessary for development and do without foreign aid if necessary. Under conditions of war it is easy for this sector of industry to switch over to the production of the necessary heavy equipment and materials. The ability to manufacture and supply machinery can also be an important instrument of diplomacy; a large part of the aid China is giving to developing countries in Asia and Africa takes the form of machinery manufactured in China and for which there is considerable demand today.

It is significant that while the machine-building sector has been expanded considerably in China in the last few years, the capacity in steel industry has been hardly increased. The emphasis here has been not so much on increasing production of steel in terms of tonnage but on widening the range of steel products produced. More particularly the focus has been on the production of special steels required for machine-building and for manufacture of other equipment.

The other sector to which China has been obviously giving a great deal of attention is agriculture. It has stepped up its chemical fertiliser production from 0.8 million tons per annum in 1958 to 3.5 million tons per annum in 1964 (the figures in both cases relating to their nitrogen content). For this purpose it has not only been importing fertiliser plants from abroad with the limited foreign exchange available to it but manufacturing plants on its own. In this context the observations of a recent Western visitor to China and India, published last April in the *Far Eastern Economic Review*, are of considerable interest :

"It was instructive to compare two new chemical fertiliser plants, one in Nangal (Punjab) and the other at Wuching (Shanghai) Wuching costs \$ 25 million, makes 100,000 tons a year, employs 2,400 people for an average \$ 30 a month—and is completely Chinese in design, construction and operation. Nangal costs \$ 65 million, produces 375,000 tons a year, employs 3,500 people for a similar average wage—and sixty foreign technicians supervised the installation of the latest British, French, German and Italian machinery. Wuching is home-spun, almost amateurish, but

with a lived-in look : Nangal is elegant and efficient but the Indian staff look almost out of place, scared to touch their sophisticated surroundings."

If what is at issue today in the conflict with Pakistan is not just the territory of Kashmir but something much more, and if it does not suit India's interests to accept Western notions of what the balance of power in South Asia should be, we have much to learn from Chinese policies in pursuit of its national interests. The Western view of South Asia in relation to the larger balance of power in the world requires two or more countries which are just strong enough to offset possible Chinese temptation to move in this direction, but which would also act as counterfoils to each other so that the control of the West over the region is at no time lost. If we do not wish to fall in with this scheme of things we should take care that we do not define 'defence orientation' too narrowly with reference to the immediate situation but take a longer and wider view of the whole problem.

India's position is of course different from that of China in several important respects. The Western Powers are not hostile to it as they are to China and indeed the stability and strength of India is vital to their own interests; if therefore India is prepared to demonstrate that it is not helplessly reliant on them (as we might indeed now demonstrate by taking measures for doing without supplies of wheat under P.L. 480), it would be still possible to get on India's terms their assistance in its development programme. India is fortunate to have also the continued support of the Soviet Union, unlike China. Not only has the Soviet Union no use for the kind of controlled power-parity in South Asia which the Western Powers are anxious to maintain between India and Pakistan but it is willing to give India precisely the sort of concrete assistance it needs for building up a strong, self-reliant economy.

India has therefore no need either to take aggressive political postures against the Big Powers or waste its resources on securing prestigious symbols (such as atom bombs) merely to establish Big Power status for itself. It only needs to recognise the points in its favour in the present international situation, refuse to sub-

mit to arm-twisting of any kind by the Western Powers. (by placing food-grain supplies on ration for some time if necessary), and direct its efforts to developing as quickly as possible its agricultural, equipment and machine-building industries. If India plays its cards well, it should be able to secure assistance from a number of countries for this purpose and achieve within a few years a degree of self-reliance adequate to discourage others from trying to push it. India's own interest is after all only to be able to defend and develop, without interference, the kind of political and economic system which it cherishes.

AGRICULTURAL PRODUCTION

V. K. R. V. RAO

IT IS NOT befitting either the dignity or self-respect of a country with a total cropped area of nearly 390 million acres and a net irrigated area of 70 million acres to be an importer of food-grains. The position becomes worse when it is remembered that even with imports, the availability of food in nutritional terms is much less per head in India than in many other countries with a much smaller area under cultivation. That after fifteen years of planning India should still find herself in a state of dependence on foreign supplies to keep her food economy going is not a matter of pride to the planner. Above all, it is a matter for profound regret that the bulk of the food-grains we import from abroad is not even paid for by us from our free foreign exchange resources but comes as a gift and a loan under various P.L. 480 provisions from the United States. Recent events have brought in a new dimension to the problem and faced the country with the possibility of a breakdown in her food supplies at a time when she is fighting for the very survival of her sovereignty and maintenance of the secular, democratic, and socialist ideals of her policy. Under the circumstances, it is not surprising that both the national leadership and the Planning Commission have declared that food production should command the highest priority in our plans for economic development and that India must reach self-sufficiency in food at the earliest possible moment. Can we do it?

I have no doubt in my mind that India can attain self-sufficiency in food if only she really makes up her mind to do so and is willing and able to put through the necessary policies and

programmes for increasing her agricultural production. While it is true that Indian agriculture still continues to be a gamble in rain, it is also a fact that she has perhaps the largest irrigated area in the world, and this becomes still larger if minor irrigation works are also taken into account. The average yields per acre in India are among the lowest in the world. But this is not due to the infertility of the soil or any technical impossibility of increasing production. It is due to the fact that we are not making the best use of the secure supplies of water that our irrigation system has provided us with. It is due to the fact that the efficiency of our minor irrigation works is at a low level because of the comparative absence of rural electrification for drawing water from our wells, tanks, rivers and rivulets. It is also due to the fact that our soil does not get replenished through the use of chemical fertilisers nor our crops protected by pesticides. It is also the result of our using seeds of low germinating quality, our failure to use hybrid seeds with high yield potentialities, and our sticking to seeds that are not capable of standing high fertiliser doses and therefore incapable of recording significant increases in yield. Our agricultural implements are still, generally speaking, of the primitive variety used by our ancestors during the days of the *Ramayana* and the *Mahabharata*. Our agricultural practices are still largely of the pre-scientific age and our system of crop-rotation prior even to the European agricultural revolution of the eighteenth century. The destruction even of a part of the food we grow by rats, rodents, birds and bad storage adds to the dismal tones of the picture that I am drawing of Indian agriculture.

The dark shades of the picture grow more bleak when we look at the state of our animal husbandry and our failure to use the large potential of fisheries that our long coast-line and our abundant supply of inland water areas give us. Surely, there has been something wrong with India if she has allowed these facts to continue in spite of the pressing national necessity both for more food and for freedom from dependence on imports.

I feel overwhelmed by the magnitude of the indictment I have made of ourselves as a nation. I feel even more appalled

at the implication this has on the success of our planning and the efficiency both of our planners and the implementation of the plans. But there is no need to despair. On the contrary, the very facts that I have given show the vast potentialities that exist for doubling and even trebling our agricultural production. And when it is remembered that our food deficit at current levels of consumption is less than 10 per cent, it should be a matter of comparative ease to make up this deficit.

Not only are our potentialities much above our immediate or even longer-term requirements, but we also know what is wrong and therefore what should be done to right the position. And we have been trying also to apply the right remedies, even though our efforts in this direction have not been adequate or sufficiently efficient to meet the needs of the situation. Thus during the fifteen years of our planning, we have increased our production of cereals by 30 million tonnes. The index of agricultural production as a whole has been showing an average annual rise of more than 3 per cent. But population has been growing at the rate of 2.2 to 2.4 per cent a year, the base levels from which we started have been sub-standard from the point of view of nutritional requirements, and our distribution system has been unable to cope with the growing requirements of food in a developing economy. Hence it is that in spite of a considerable measure of success in absolute terms, in the agricultural field, we continue to depend on imports and live from hand to mouth in regard to this most basic necessity of human existence.

What the food situation of India clearly reveals is not that we have done nothing to cope with it but that we should do far more than we have done so far, and do that with more vigour, more systematic planning and a better sense of basic priorities.

This is precisely what we are now trying to do. The Fourth Plan centres on the fulcrum of self-reliance and our highest priority is the maximisation of food production. Recent events have been a blessing in disguise, for they have made the country much more conscious of the need to solve our food problem even for national survival. The national will to become self-sufficient in food not only in terms of current consumption but

also in terms of better nutritional standards has now begun to emerge in unmistakable fashion. Government, planners and the public are all beginning to combine in one great national movement for self-reliance and self-sufficiency in food. The climate is now right for attempting a great leap forward in our agricultural production.

But mere will is not enough. What is needed is better planning and more efficient implementation. This is precisely what the Planning Commission is now trying to do. I outline below in summary form the main elements of the new agricultural planning with which, we hope, the country will move towards self-reliance and self-sufficiency in food :

(1) It is not enough to go in for more irrigation or increased supplies of water for agricultural purposes. It is also important to see that our water supplies are put to the most efficient use. Water management is now recognised as a 'must' in agricultural technology. Water management has to be accompanied by suitable systems of crop patterns and crop rotation, use of high-yielding seed, application of adequate and appropriate quantities of chemical fertilisers and pesticides, and adoption of improved and scientific agricultural practices. This is now being attempted in the I.D.P. and the I.A.D. districts; and attempts will be made to step up both the coverage and the efficiency of these programmes during the Fourth Plan period. In addition, special area development programmes will be undertaken in the newly irrigable command areas with a view to getting the best economic returns from the supplies of water newly made available.

(2) Special 'crash programmes' will be undertaken to utilise the irrigation potential created by the major and medium irrigation works by planned reduction of the time-lag between potential and utilisation. Simultaneously, attempts will be made for reducing the time span between the start and completion of major and medium irrigation works.

(3) More systematic attention will be paid to the stepping up of the efficiency of minor irrigation works by the installation and energisation of pump sets, accompanied by an appropriate demonstration and supply programme of agricultural facilities.

and techniques aimed at maximising production. Simultaneously, attempts will be made not only to increase the number of minor irrigation works but also to see that the existing ones are kept in a proper state of maintenance and those needing repair like silted tanks, wells with lower water tables, etc., brought into a state of efficiency. All this will enable the country to get quicker and larger dividends from the investment in minor irrigation.

(4) Soil conservation is another programme to which more attention will be paid. This will aim not only at quantitative expansion, but at a more scientific base, taking into account water sheds, forest areas, nature and contour of the soil, and built-in provision for both maintenance and effective utilisation of the area taken up by the bunds.

(5) Seed is another, and in some ways a most important, component in the agricultural planning that we are undertaking. Hybrid jowar, hybrid bajra and hybrid maize are all capable of bringing about substantial increases in yield; they are also the crops whose greater efficiency will improve the economic conditions of our smaller and poorer farmers. Recent experiments have shown that certain foreign varieties of wheat and rice like the Mexican Senora 64, Lerma Rojo and V. 18 in the case of wheat and Taichung Native 1 in the case of rice are capable of bringing about large increases in yield, given water and fertilisers. Indo-Japanese varieties of paddy also promise substantial results. Attention will therefore be concentrated during the Fourth Plan period on a comprehensive seed programme, including its multiplication, certification and utilisation, especially in areas where the availability of water and the supply of fertilisers make it possible for them to reach their maximum potential yields. The possibilities of this programme are seen from the expectation of an additional production of 25 million tonnes by its application to an area of only 32.5 million acres during the Fourth Plan period.

(6) Fertilisers of course constitute the most important input for a massive increase in agricultural production. The Fourth Plan therefore contemplates a substantial stepping up in the use of chemical fertilisers to the tune of more than 3 to 3½ times the

level reached at the end of the Third Plan period, and along with it the application of appropriate quantities and varieties of pesticides. All this will involve a terrific organisational effort in terms of education, research, demonstration, supplies and distribution.

(7) Increasing the efficiency of agricultural implements is another important way of increasing agricultural production. During the Fourth Plan, emphasis will be laid on modern implements like tractors, power tillers, harvesters and the like, and also on improving the efficiency of implements that can be worked by animal power. Provision on an extensive scale for repair and maintenance facilities will be made, for without such facilities it would be impossible to bring about any substantial increase in their use.

(8) Account is also being taken of the need to link up credit and marketing facilities with programmes for increased agricultural production. While every attempt will be made to improve the efficiency of the co-operative system in this regard, alternative institutions will also be set up where necessary to see that lack of credit and marketing facilities does not hold up or hamper individual or area programmes for production.

(9) Modernising agriculture does not just mean provision of material inputs. Research and extension are an essential precondition of agricultural progress. Accordingly, the Fourth Plan envisages a comprehensive programme for co-ordinating and expanding agricultural research on a nation-wide scale, linking it up with the complexity and variety of the problems on the field natural to a vast country like India, giving a practical bias to the training given in our agricultural colleges and diploma institutions, and tying them up with concrete development programmes in the agricultural areas in their vicinity. The Fourth Plan also includes a comprehensive programme for rural adult education, the training of practising farmers, setting up of junior agricultural schools, and the promotion of an agricultural and scientific bias in our system of elementary and secondary education.

(10) Agriculture is essentially a local industry; and unless it is tackled in a planned, integrated and comprehensive manner at

the local levels, no amount of national planning or national supplies will lead to the desired increase in agricultural production. That is why so much stress is being laid in the Fourth Plan on district and block plans for agricultural development, with an agricultural planning cell at the State headquarters for bringing about the necessary dovetailing and co-ordination between local and State plans for increasing agricultural production.

(11) In our system of administration—for that matter, in any system of administration—it is not possible to bring under one administrative department all the facilities and activities that go to make up a comprehensive programme for increasing agricultural production. Irrigation, Power, Credit, Roads, Fertilisers, Seeds, Implements, Research, Education, Extension—all these are vital to agriculture and yet they are and cannot but be under separate ministries and departments. Hence the need for co-ordination at both the ministerial and official levels, both at the Centre and in the States. This has been recognised and action taken to secure the necessary machinery for the purpose, though I cannot say that this machinery is working with the requisite efficiency or firmness, clarity of purpose or dynamism so essential for a massive programme in agriculture. Thus we have an Agricultural Production Board at the Centre, Cabinet sub-committees for agricultural production programmes in the States, Agricultural Production Commissioners in the States and their counterparts in the districts, and other appropriate bodies of officials at various levels. What is needed is more efficient working of these boards and officials and also better inter-communication and co-ordination with non-official individuals and organisations in the field. The Fourth Plan will concentrate special attention on this factor.

(12) Finally, and in some ways this is the most important advance that has been made in our agricultural planning, the Fourth Plan is based on a recognition of the need for having an integrated agricultural plan within the framework of the overall Plan. Thus, we will have during the Fourth Plan period an agricultural plan that will not only bring together the various programmes and targets relevant thereto but also identify and give

priority to all activities in other sectors which have a bearing on the implementation of the agricultural plan. All these have to be planned in such a manner as to give them not only the appropriate inter-sectoral balances, including both availabilities and outlets, but the required time-phasing and programming as well. The integrated agricultural plan will cover all the appropriate and inter-connected sectors; it will also include commodity-wise, programme-wise and area-wise sections, all of which in turn will have the necessary inter-sectoral tie-up. It is this integrated and comprehensive agricultural plan that needs to be given the highest priority if we mean what we say by the statement that agriculture will command the highest priority in the Fourth Plan. Thus, fertilisers, pesticides and agricultural implements should command higher priority than other sectors in industry; and agricultural education and research in education, rural transport in transport, rural electrification in electrification, and agricultural needs in allotment of cement, bricks, iron and steel, and foreign exchange. In order to see that this is done and to emphasise the comprehensive and inter-sectoral character of maximising agricultural production, it is proposed to bring out separate volumes for the agricultural plan of the country as a whole as well as for the different States which make up the Indian Union.

The Fourth Plan also contains significant programmes for animal husbandry, fisheries, poultry, piggery, subsidiary foods like potatoes, sweet potatoes and tapioca, horticulture, storage and warehousing and improved processing. Space does not permit me to elaborate on any of these items, but it is necessary to mention them to complete the record.

I hope what I have said above gives some justification for the optimistic undertones of this article in spite of the pessimistic overtures with which it has been started. I do believe it is possible for India to reach self-reliance in her food supplies at current levels of consumption before the end of the Fourth Plan period. I also believe that my faith is based on scientific and realistic reasoning and not on just wishful thinking. Self-sufficiency at current levels of consumption is of course not enough. What we need is also a rise in the levels and quality of our

food consumption so that we may reach nutritional standards comparable to those of the developed countries. All this should be true not only for our classes but also for our masses. I am sure we will do this too, though it may take us two more Plan periods before we reach this goal. But, as Gandhiji used to say, one step at a time is enough. Our immediate task is to rid the country of the stultifying and nationally dangerous dependence on imports for our food supplies. This, I think, can be done by implementing the agricultural programmes and the comprehensive multi-sector integrated agricultural plan that the Planning Commission intends to put before the country for the Fourth Plan period.

FOOD POLICY

M. L. DANTWALA

NEXT TO THE requirements of defence, an uninterrupted flow of food-grains to the consumers in adequate quantities and at reasonable prices assumes critical importance during the emergency. For the last few years, the food situation has been difficult. Production has not kept pace with the rising demand. The substantial increase of nearly 8 million tonnes in food-grains production during the current year was not sufficient to bring down prices. The coming kharif crop may not be on par with the last year's crop. It is, therefore, imperative to be thoroughly prepared to be able to cope with any further difficulties which an emergency may impose. If it comes to it, the nation should be prepared to live with its own domestic production; and, as we shall see with the help of a few facts and figures, this can be done. All that is needed is a firm food policy, voluntary discipline and some sacrifice on the part of the producer as well as the consumer. But the sacrifice involved will be only a fraction of what our armed forces make on the battle-front.

The *per capita* availability of cereals in 1964-65 from net domestic production was 13.2 ounces per day. This was no more than what was similarly available in the year 1961 and 1962. During the two intervening years the *per capita* availability was smaller. During all these years we have depended upon substantial imports, particularly of wheat, to supplement the domestic production. As a result of the imports, the *per capita* availability in 1965 increased from 13.2 to 14.5 ounces per day. The increase through imports thus amounts to only 1.3 ounces per day *per capita*. In the aggregate the imports amount to sub-

stantial quantities, but if we can manage equitable distribution of the domestic supply, the cut in consumption would be only marginal. We hope that the imports will be maintained, but it would be wise to utilise them for building up buffer stocks which will enhance our capacity to withstand any deterioration in the situation.

The statistically calculated average *per capita* availabilities are, however, a poor consolation if they do not become realities in every region and for every person in the country. The regional pattern of production obviously does not match regional requirements; and even the regional availability does not necessarily get equitably distributed over the entire population of the region. The latter phenomenon is not uncommon even in normal times. But in the context of shortages, unequal distribution entails serious consequences.

The basic objective of food policy must be the equitable sharing of nationally available supplies at reasonable prices, irrespective of regional variations in production. The food policy adopted by the Government during the last few years has been directed towards this objective and has achieved a measure of success. One is aware that there is still much dissatisfaction with some facets of the policy and the results achieved. This is not the time for controversy, but a few facts may help to clarify the position.

Firstly, it is important to note that in the year 1965 approximately 60.0 per cent of wheat consumption—by non-producers—and 23.6 per cent of rice consumption was supplied by the Government at low and controlled prices through the system of fair prices and ration shops. In the case of rice this was facilitated by the procurement of nearly 30 lakh tonnes of rice which constitutes as much as one-fourth of the marketable surplus in rice.

Secondly, it can be stated with confidence that, by and large, the pattern of regional distribution of cereals in 1964-65 broadly conforms to the pattern which prevailed during the period when the situation was not so difficult. Large quantities of rice from domestic procurement and of wheat from imports have been distributed to the deficit States to make good the shortage in

their own production. Thus, the *per capita* daily availability of 11.8 ounces of cereals from internal production in Maharashtra was increased to 15 ounces and that in Kerala similarly from 5.30 ounces to 12 ounces by dispatches from other States.

By and large, therefore, the food policy which is being followed is on the right lines; what is needed is to pursue it with a greater degree of firmness, to expand its operation and improve its working.

The Food Minister has already announced that, in view of the emergency, all cities with a population of a lakh and above should be statutorily rationed. This would require, on the basis of 12 ounces (of rice and wheat in suitable proportions, region-wise) per day per adult, an assured supply of about 59 lakh tonnes—25.1 of rice and 33.9 of wheat. Besides this, another 20 to 25 lakh tonnes would be required for other urban areas. If wheat supplies are to be cut owing to the reduction in imports, or the building up of buffer stocks, some cut in the overall ration and an increase in the rice component would become necessary. Hitherto no serious attempts have been made to procure wheat and coarse grains from domestic production. It is time this is now attempted in all earnestness. It should be our aim to acquire 10 to 15 lakh tonnes of wheat and about 40 lakh tonnes of rice during the ensuing season. If the crop during the next year is not as good as the current year's crop, procurement of these quantities will necessitate a greatly improved system of procurement and the understanding co-operation of the producers. Hitherto procurement has been by and large on a voluntary basis. In several States stocks were acquired either from the rice miller or from the trader. It will now be necessary to establish direct contact with the producer. He is after all the source of original supply. If a proportion of his produce is needed for national purpose, the Government should approach him directly rather than through any intermediaries. The small producer who produces no more than what is needed for his domestic consumption should be exempted from the levy. Correspondingly, the larger growers will have to deliver a larger proportion of their produce.

Procurement implies a fixed price and this price should be

fair and reasonable by reference to the price in the ration shops. The Government has accepted the principle of guaranteeing minimum support prices to the producer. The procurement prices and the ruling market prices would be higher than the minimum support prices. This is no time to demand still higher prices for food-grains. Any large-scale subsidising of consumer prices will be equally inappropriate. Heavy defence expenditure tends to be inflationary. Every attempt must therefore be made to keep down the prices consistently with efficiency of production and the need to augment it.

Under the scheme of compulsory graded levy, if it does not amount to monopoly procurement, the farmer will be free to sell the rest of his marketable surplus in the open market. It is here that the trading community has to assume the responsibility of maintaining the price line. It would be most graceful if this responsibility is discharged through voluntary discipline. The administration today has many more vital tasks to attend to; and it would be unfortunate if it is required to divert its energies to regulating the trade. Temptations to profiteer would be many and too trying to resist. But they can be curbed by the thought of the suffering and sacrifice by our men in the armed forces in protecting our life and liberty.

SELF-RELIANCE IN INDUSTRY

S. G. BARVE

IN THE LIGHT OF the new situation facing the country, it is obviously necessary to take a second and hard look at the programmes of industrial development that we may take up in the immediate future. One thing, however, may be said straightaway. While a great deal more still remains to be achieved, the new situation calls for *an intensification* and *quickenning* of trends already being developed, rather than any sort of breaking away from such trends. The new emergency only reinforces the need for an intensified drive towards self-reliance in industry which has already been an outstanding feature of our Plan strategy at least since the commencement of the Second Plan period. Many steps have already been taken towards development of economic self-reliance. Consider, for instance, the case of steel or of oil or of machine-building capacity or of transport and communications equipment or equipment for the generation of power. In all these vital fields, we have taken big strides in the last eight or ten years.

When foreign aid shipments were threatened to be stopped during the war, Pakistani spokesmen felt horrified at the prospect. India has an 80 per cent indigenous defence potential, they said, against 20 per cent of Pakistan. That was testimony to the basic soundness of India's planning policies. We had not chosen the easy way of only expanding production of consumer goods, although this also has by no means been stationary. Our main effort, however, has been towards planning in depth, that is to say not merely towards increasing the production of wealth but also towards building up a greater capacity and a wider base of *the means of* production of wealth.

Steel is the sinews of modern industrial development. Over the last eight years, we have been steadily plugging away at a programme which in the perspective aims at attaining a gross steel production fully adequate to cope with the growing demand of steel over the years. We are already going into the more sophisticated lines of special steels and alloy steels. Special steels have a great significance for the development of a wide variety of the more advanced engineering goods—automobiles, electrical equipment, refrigeration equipment, pressure vessels and so on.

We are now producing something like a third of our requirements of crude oil. This new development in oil exploration commenced only in 1957. If we go on steadily developing, as we have been doing, to the full extent of our potential and physical possibilities in regard to oil exploration and exploitation of oil resources, we would attain a rapidly increasing measure of self-reliance. In the recent emergency, on taking stock of the position, we could reach the comforting conclusion that at a pinch, should all imports even be stopped (which was unlikely), we could carry on in the country for our defence and essential requirements for months ahead and even indefinitely.

We have built up a great deal of machine-building capacity in the recent years. I shall cite only a few illustrations. We now make the bulk of sugar plant machinery, cement machinery, textile machinery, the normal range of machine tools, diesel locomotives, wagons and coaches, bicycles, fans, sewing machines, electrical pumps, and lots and lots of other things.

In consumption goods, we now make a wide range of our normal requirements, sugar, cement, paper, the whole wide range of rubber goods, drugs and pharmaceuticals, cellulose fibres, etc.

The issue of self-reliance must be considered in its numerous dimensions. First, there is the question of producing consumer goods including durables, most of which we can make ourselves now. It may be that the total production of some of these may not be, and indeed is not, large enough; however, there is no question about our capability for producing these. It is now only a question of time and adequate investment resources.

The next and far more important dimension of self-reliance

is machine-making capacity. In this dimension of self-reliance also, considerable progress has been made; further big strides are contemplated in the next five years. Thus, power equipment capacity, that is, turbines, boilers, transformers, switchgear, etc., to be established in the Fourth Plan would bring us virtually to a level of self-sufficiency. Thereafter, practically all our requirements for additional power could be found indigenously.

Take transport : In wagons and coaches we are already self-sufficient and indeed have a potentiality for export. We make diesel and electrical locomotives even today, but the imported components are rather high. We should reach 70-80 per cent self-sufficiency by the end of the Fourth Plan in this important field.

We are putting up large capacity for fertiliser production so as to be self-sufficient in fertilisers in the next three or four years. We must, however, look further ahead and develop capacity for putting up one or two new fertiliser factories ourselves every year steadily thereafter. We are planning to develop this capability by the end of the Fourth Plan.

We make about half of our requirements of machine tools today. By the end of the Fourth Plan, we should reach about 75 or 80 per cent in both volume and variety.

Today automobiles are made indigenously in India and the indigenous content is 80 or 85 per cent already.

We make diesel engines, electrical pumps, compressors, motors, lifts and most of the constructional equipment. There are certain deficiencies and inadequacies as in gear-making capacity, making of heavier cranes, making of larger compressors and pumps and pressure vessels. These gaps in machine-making capacity are being identified and we are hoping to fill them up by the end of the Fourth Plan.

There is yet another dimension of self-reliance. We must develop not merely machine-building capacity but an adequate indigenous level of technological competence both in producing final products and in setting up plants.

Maybe we can do a third of a steel plant indigenously today. By the end of the Fourth Plan, we should be able to do 50 per

cent or even more. I do hope Government will be in a position to decide to entrust to our own engineers the full designing and setting up of the sixth steel plant. We must be prepared to allow our technologists even to make mistakes.

We are now putting up petrol refineries with foreign collaboration. This is a new field and, of course, we need this assistance. But we must simultaneously build up the designing and engineering capability to put up future refinery units ourselves. The Oil and Natural Gas Commission are alive to this and are moving in that direction. Likewise, while for the crash programme in hand we must get our fertiliser factories built with imported know-how, we must simultaneously develop not only the engineering capacity to fabricate such plants ourselves but also the design and process know-how to plan new factories and work them.

Design and consultancy agencies are being built up; the National Industrial Development Corporation, the Fertiliser Corporation, the Oil and Natural Gas Commission, Hindustan Steel Limited are developing the design and consultancy expertise in their respective fields. In the private sector also, similar technological abilities are being constantly developed.

I must confess that we have been a little too prone to rely upon foreign collaboration and a little over-ready to avail ourselves of foreign aid just because it was forthcoming. A chastening of outlook in these matters is all to the good, I think. It will not only not slow down progress but in fact accelerate it and place it on a surer footing. There is a great deal of scope for utilising our industrial capacity and drawing on our indigenous capabilities of technological skill. Indeed some of the capacity is idle or under-utilised. It is not a bad thing that we will now be thrown back on ourselves to a greater degree.

Of course, I do not advocate an economy of siege or an economy of isolation without foreign aid. But foreign aid must be like a walking stick and not like a crutch. With the foreign aid that is already committed and in the pipe-line and given a reasonable modicum of flow to supplement it in well-chosen directions for a while, we can attain an adequate degree of self-

reliance within a short time. I, therefore, do not take a tragic view of the situation at all. In fact, I look upon it as a challenge and an opportunity.

We are a large country with a very wide spectrum of nature's endowments by way of natural resources. Barring a few things like some non-ferrous metals, sulphur and phosphorus and a few other things, we possess resources for practically everything else which a modern industrial community needs. Self-reliance is, therefore, a thoroughly practicable objective for our economic policy.

However, self-reliance does not mean self-sufficiency. No country in the world produces in normal times everything that it needs. In fact, as industry develops and as prosperity grows, the volume of trade also increases. The imports of the country do not diminish but in fact grow with the growth of industry. However, self-reliance does mean two things : that in an emergency we should be able to carry on on our own for the necessary length of time; secondly, that for our requirements of imports we would earn the necessary foreign exchange by an adequate volume of exports and should be able to procure these through the normal commercial channels and not be dependent upon foreign loans or aid for the purpose. Foreign investment within the terms of the national policy is welcome as an addition to the pool of investment resources available because while it comes it helps quicken development. Its cessation should, however, not mean a drying up of imports, without which the economy would grind to a standstill.

If imports normally are likely to increase with the growth of industry, how would the country's foreign trade be balanced ? A healthy industrial growth should develop a corresponding export potentiality to pay for the imports that would accompany the growth in industry. It is this failure to develop an adequate export potentiality with its growth which is the real weakness of our recent industrial development. A review of policies bearing upon this complex issue is undoubtedly one of the prime requisites in the wider context of a policy of self-reliance.

Today we are in the transitional stage of industrial develop-

ment. The problems are relatively easy both when a country is fully undeveloped or when it is fully developed. When a country is fully developed, the setting up of a new factory presents no problems. You engage the necessary consultancy services, order the necessary equipment and facilities, sometimes purchasing items of machinery even off the shelf, assemble them on the site and there goes the factory. On the other hand when you are completely undeveloped, there is no alternative but to order out the complete plant from abroad and to entrust a turn-key job to your foreign consultants. The real difficulties are met with when you are in the transitional stage; when you can make some of the components but not the entire machine; or some of the machines but not all those which are needed for the plant; or do not possess indigenously the process know-how; or have not yet built up the consulting, designing and engineering capability for putting up a complex plant such as a fertiliser factory or a steel plant. There are all manner of difficulties to be faced in this situation : foreign technical collaborators whom you must engage because you have not got the technical know-how, frequently impose conditions which, apart from their royalties and fees, entail wholesale importing of machinery where only a few components would have done; entire plants even though some of the machinery could be supplied indigenously and so on. If you are also dependent upon foreign assistance, this may not be available in free foreign exchange and you may be forced to accept the technology and equipment available only in the aid-giving country and so on. India happens to be in this stage at the moment. There is no alternative to it but to press on with the job deciding each case as much to the national advantage as possible, using indigenous technologies and machinery even if it may not be quite up to the mark. The situation calls for a spirit of enterprise and daring combined with a full rapport between the organisational and the technical levels.

Swarajya is incomplete and indeed insecure without 'swavalamban'. There is no question about private and public sector in this context. Economic self-reliance appertains to the national sector as a whole. Industrial capacity, technical skill and

the faculty of improvisation must be identified and put to work wherever found. We have all the elements and resources at hand for a solution of the problem. It is only a question of will and organisation.

DEFENCE PRODUCTION

A. M. THOMAS

AN IMPORTANT OBJECTIVE of our defence thinking and planning in India has always been the attainment of self-sufficiency in the shortest possible time and in as large a range of defence stores as possible. Even when we have sought assistance from friendly countries, and offers have been available for direct supply of arms and ammunition, we have shown preference for assistance in the form of supply of technical know-how and plant and equipment for the production of these items in India.

Since the Chinese aggression in 1962, defence production has been given considerable importance. Many ordnance factories work round the clock and a number of schemes have been launched for production of new types of arms, ammunition, vehicles, general stores and other equipment. Some of the important items so established since 1962 are the semi-automatic rifle and its ammunition, an improved version of carbines, tank gun, heavy mortar, aircraft gun ammunition, a new mountain gun and new types of anti-tank ammunition.

A considerable portion of our equipment in the ordnance factories is very old and a number of schemes have been undertaken to modernise these factories, not only for the production of new items but also to enhance the rate of production of a number of existing items.

In recent years there has been spectacular increase in the total value of issues from the ordnance factories. From Rs. 41.88 crore in 1961-62 the value of production increased by three times to Rs. 111.34 crore in 1963-64.

At the end of 1962 there were 20 ordnance factories. In a

period of three years, four new ordnance factories have been established for the manufacture of items ranging from cables to high explosives. In the course of another three years from now, four more ordnance factories are expected to be established.

Ordnance factories have also manufactured so far over 5,900 Shaktiman trucks, 11,200 Nissan one-tonne trucks and 4,500 Nissan patrol jeeps to provide transport to the Army as well as the Border Road Organisation. The indigenous content of Shaktiman is over 70 per cent, that of Nissan one-tonne truck over 38 per cent and of Nissan patrol jeep over 31 per cent. A composite vehicle factory is being set up shortly to expand further the production capacity for these vehicles.

Ordnance factories have also so far manufactured over 1,000 tractors of four different types, which have been of invaluable assistance to the Army as well as the Border Road Organisation.

The production of snow garments, winter garments and cotton garments has been stepped up in ordnance factories. In some cases the increase has been as much as 300 per cent. Bulk production of a new type of man-dropping parachute is also to commence shortly and production has been established of a special type of pack plaster for parachropping of jeeps.

An assignment on which the ordnance factories look back with great pride has been the manufacture of mountaineering clothing and equipment of all types for the successful Indian Everest Expedition this year. The members of the Expedition have been very happy with the quality of this equipment.

Since the emergency, declared in 1962, we have obtained maximum assistance from the civil industry for the manufacture of armament components and general engineering stores. So far orders worth over Rs. 15 crore have been placed on civil industries. It is a matter of considerable gratification to us that the civil industry generally has risen to the occasion and done its best to meet the high demands placed on them.

The Hindustan Aircraft Limited was established at Bangalore in 1940 for the assembly of trainer aircraft, fighters and bombers. Since then the factory has never looked back. Among the projects of manufacture carried out by the factory at Bangalore

were the assembly and manufacture, under licence, of the Prentice trainer aircraft and Vampire jet fighters. In 1957, it was decided to manufacture under licence the Gnat fighter aircraft which in recent action against Pakistan has proved to be the redoubtable foe of both the Patton tanks and the Sabre jets of Pakistan.

In October 1964, the Hindustan Aeronautics Limited came into being in which the Hindustan Aircraft Limited was merged. Amongst the current manufacturing programmes of this Company are the Gnat fighters, AVRO 748, Alouette helicopters and their engines, light aircraft, basic jet trainer, supersonic jet fighter, HF-24 and MIG-21 aircraft. Besides the factories at Bangalore and Kanpur, a complex of three factories is being set up at Nasik, Koraput and Hyderabad.

Bharat Electronics at Bangalore was registered in April 1954 and the number of types of equipment and the value of production in this factory have been progressively increasing year by year. At present the factory manufactures over 70 different types of equipment ranging from tiny transmitters for upper air observation to high-power transmitters and sophisticated radar equipment and also various components, such as valves, transistors, capacitors and crystals.

The production of electronic components is essential for a rapid development of the electronic equipment industry. Bharat Electronics Limited has accordingly set up facilities for the production of receiving valves, germanium semi-conductors, silver, mica and ceramic capacitors and piezo electric crystals. The new manufacture programme will include manufacture of silicon semi-conductors, transmitting tubes, magnetrons and X-ray tubes.

The Mazagon Dock at Bombay and the Garden Reach Workshop at Calcutta were acquired by the Government of India in 1960 for the purpose of ship repair and ship construction. These workshops can undertake a variety of work ranging from construction of passenger-cum-cargo boats, ferries, light naval craft, river steamers, flats, water boats, pontoons, etc. They also have capacity for a considerable amount of general engineering work. A frigate construction project is currently in progress at Mazagon

Dock Limited and projects for the manufacture of air compressors, road rollers and marine diesel engines are in progress at the Garden Reach Workshop at Calcutta.

A measure of the volume of work that is being undertaken in the public sector undertakings under the Defence Ministry may be obtained from the fact that over Rs. 30 crore worth of production was attained in 1963-64.

Modern armament technology is developing so fast that it is often said that many of the items get obsolescent even while they are on the drawing board. This merely highlights the need for defence research and development to keep pace with the technological advances and adapt them continuously to our defence needs. The Research and Development Organisation in the Ministry of Defence has been fully aware of its important role and has lived up to our high expectations. The Research and Development Organisation covers a wide field of armaments, electronics, engineering equipment, aeronautics, food and general stores, physiology, naval research, psychological research, etc.

With every production organisation in the Ministry of Defence is associated an independent inspection organisation which ensures that production of high quality is continuously maintained. The Directorate-General of Inspection covers a wide range of defence stores such as armaments, ammunition, vehicles, engineering stores, electrical stores, etc. that are produced in ordnance factories, public sector undertakings and the civil sector.

When we were engaged in our defensive action against Pakistan recently, the Governments of U.S.A. and U.K. suddenly withdrew the assistance which they had been extending to us to strengthen our border defences against China, in spite of the fact that we took care not to use equipment received from them against Pakistan and in spite of China's collusion with Pakistan to reactivate the multiple fronts in our north and north-eastern border.

To a situation that was designed to generate widespread alarm, the entire nation has reacted with remarkable equanimity and a supreme sense of confidence in its strength. In the cultivation of this confidence, the ordnance factories, the Hindustan Aero-

navitics Limited and other organisations in the Defence Production Department have played no little part.

Self-sufficiency in defence production has been a challenge to the thousands of technicians and factory workers engaged in this most important field. They have made a great contribution to our survival as a nation. When we consider the Himalayan proportions of the difficulties we encounter day after day in the design and development of new items and new techniques and in the achievement of ambitious production targets in the ordnance factories and other undertakings, we can say with pride and joy that the challenge has been well met, with imagination, initiative and competence. It is a performance of which the fighting services, because of their intimate association with defence production, and the patriotic public are justly proud.

PUBLIC ENTERPRISES

PANAMPILLI GOVINDA MENON

SINCE THE BEGINNING of the First Five Year Plan, the public sector has seen a very rapid growth. From somewhat humble beginnings we have in the public sector today several giant undertakings like those producing iron and steel, oil, coal, fertilisers and electrical equipment. Besides these key industries, the public sector also produces a large variety of consumer goods and specialised items of basic and strategic importance such as drugs and pharmaceuticals, telephone, telegraph and wireless equipment, aircraft and ships. The public sector also includes internal and international air transport, shipping, certain trading and business activities, such as the work undertaken by the Life Insurance Corporation, the State Trading Corporation, Ashoka Hotels Ltd., etc.

The basic philosophy of our public sector enterprises is the building up of a socialist pattern of society. Economic considerations apart, a certain degree of responsibility is cast upon the public sector to make the economy self-reliant. If we are to progress rapidly, it is also vital that we develop self-confidence, which is a sign of maturity, and break the shackles of dependence on advanced countries for every new venture. It is a matter of satisfaction that although most of our public sector enterprises are comparatively young, on the whole they have made an effective contribution towards the building up of a self-reliant economy.

In 1960-61, we were producing 3.3 million tons of steel ingots and 2.4 million tons of saleable steel. At the end of the Third Plan, the production is likely to be 7.8 million tons and 5.8 million tons respectively. In 1960-61, the actual production

of nitrogenous fertilisers was 97,200 tons and that of phosphatic fertilisers 53,000 tons. At the end of the Third Plan the production is likely to be 500,000 tons of the former and 200,000 tons of the latter. In 1960-61, production of sulphadiazine and penicillin was 145 tons and 39.7 mill. mega units respectively. These are only a few illustrations of the increase in industrial production largely due to the public sector.

Apart from the fact that the goods produced by these public sector industries contribute greatly to the economic development of the country, they also help to save foreign exchange resources by avoiding the necessity of imports. For example, in 1950-51, when total demand for steel was 14 lakh tons, our imports constituted 25.2 per cent while in 1963-64 when the demand increased to 52.8 lakh tons the imports were only 18.6 per cent. Prior to the starting of our fertiliser factories in the public sector, all our requirements of chemical fertilisers were met by imports, but today imports of fertilisers have been considerably reduced though the consumption has gone up from 52,000 tons in 1952 to 448,000 tons in 1964. Similarly, the imports of telecommunication equipment, machine tools, equipment for electric generation and distribution etc. have all considerably diminished.

Apart from the savings effected in foreign exchange, many of our undertakings have also earned valuable foreign exchange by exports of their products. For example, the Hindustan Steel Limited exported iron and steel worth Rs. 7.26 million in 1963-64. The Indian Telephone Industries Ltd. exported telecommunication equipment worth Rs. 5.6 lakh during the same year.

Whenever a heavy industry is set up, a large network of other industries is automatically created. Rerolling industry, for instance, has received considerable impetus in recent years as a result of the steel plants. Hindustan Insecticides, Hindustan Antibiotics and the fertiliser factories have likewise led to the growth of chemical industries in the private sector. The oil refineries have opened up the prospects of a vast number of petro-chemical industries. A fertiliser factory, a thermal plant and a clay washing unit sprang up on the Neyveli Lignite Corporation beginning to work. Hindustan Steel Ltd. has led to the development of refractory industry.

One of the greater benefits which we have derived by setting up these great public enterprises is the acquisition of a vast know-how which is essential for building up self-reliance in our economy. There is no doubt that our engineers and technicians have been quick to acquire and develop the necessary skills in several fields from steel making to atomic energy in a comparatively short spell of time. Indian engineers can today by themselves design and construct new factories. For example, the work relating to the drawing up of project reports for expansion of the Durgapur and Rourkela Steel Plants has been handled by the Central Engineering and Design Bureau of Hindustan Steel Limited. A Planning and Development Division has been set up by the Fertiliser Corporation of India Limited for planning and developing their new projects. It has been claimed that in the field of fertiliser technology there would be nothing beyond their competence if they were able to purchase process know-how for high pressure ammonia and urea synthesis. This Division will undertake the entire work relating to the ammonium sulphate plant at Namrup.

Besides the large amount of foreign exchange that the country would be saving in consultancy fees with the development of this know-how, it will instil a sense of self-confidence in our technicians which is vital for the efficient development of our industries. How valuable this aspect of self-reliance is will be realised from the fact that for the foundry forge project of the Heavy Engineering Corporation alone we had to pay Rs. 183.68 lakh as consultancy fees. Similarly, a sum of over Rs. 2 crore was paid to consultants for the preparation of detailed project reports alone for the four projects of the Heavy Electricals Ltd.

The Third Five Year Plan envisaged that by efficient conduct of enterprises and by following a rational and economically sound price policy for their products and services, public enterprises should be able to generate internal resources which should be available to these enterprises for their expansion after providing for their working expenses, normal replacements, interests and dividend.

It is satisfying to find that some of our undertakings have

achieved this objective. For instance, the Hindustan Machine Tools Limited has financed entirely from its internal resources the establishment of two machine tool factories during the Third Five Year Plan period. It also expects to produce from its own resources a capital of as much as Rs. 20 crore for investment in its five new factories to be established during the Fourth Plan. Similarly in the case of the Fertiliser Corporation the total resources expected to be generated by their production units over the Third Plan period are stated to be of the order of Rs. 41.32 crore after payment of interest of Rs. 5.16 crore on loans from Government. These resources are being utilised for the development of new projects and expansion schemes.

No one would claim that the public enterprises are working at maximum efficiency. They have several shortcomings which are perhaps inevitable in a developing country where new skills have to be acquired and techniques perfected. By and large, however, it must be said to their credit that they have achieved considerable success in fulfilling their objects. There is, however, much scope for improvement. It is my view that with greater attention at both the Government and the project level a greater contribution could be made by the public sector enterprises in building up a self-reliant economy.

The Estimates Committee and the Public Undertakings Committee of Parliament have had the privilege of examining several of these undertakings and in their reports they have pointed out several shortcomings like delays in starting of the projects, non-achievement of rated capacities, etc. Similarly, we have missed several opportunities of utilising Indian know-how and have preferred foreign collaboration. In the matter of generating financial surpluses also, better results could have been possible had the enterprises worked at optimum efficiency. In the matter of setting up of ancillary and auxiliary industries and developing indigenous capacity for plant and machinery also, perhaps much more could be done. But there is no doubt whatever in my mind that we are proceeding on the right lines since all the public enterprises are showing a keen awareness to improve their working efficiency and learn from experience.

PETROLEUM PRODUCTS

HUMAYUN KABIR

NO COUNTRY in the world—with perhaps one or two exceptions—is completely self-sufficient in petroleum products. Even a country like the Soviet Union imports certain types of transformer oil and some axle oil from Rumania. The United States imports certain specialised products, certain types of catalysts and additives because in the economics of international trade there are obvious advantages of such interchange. The idea of complete self-sufficiency—that every country will produce everything—is in fact untenable in the modern world.

Having said this, I would like to state that India today is already surplus in motor spirit. We shall soon be self-sufficient in high speed diesel oil. We shall increase considerably our production of kerosene and reach near self-sufficiency by 1971. We are now thinking of setting up new lubricating plants. Apart from Barauni, Madras and Haldia in the public sector, an agreement has recently been signed with ESSO for the construction of a jointly owned lubricating plant at Bombay. Within the next ten years or so, India will meet the major part of her requirements from her own production in most petroleum products.

All oil policy starts with crude. Unless there is crude to refine, there cannot be any oil industry. The Oil and Natural Gas Commission, set up to explore and produce crude oil, has proved the existence of reserves in several new areas. Since the time we have had a whole-time Chairman for the Commission, there has been a great improvement in its functioning. Both in exploration and production, there has been substantial progress. Technical experts have also been put on the Commission as Members by virtue of their special knowledge.

The Commission has set before it an ambitious but realistic target. Our present proved reserves amount to over 100 million tonnes. We have found in Assam itself some additional reserves and we are hoping to find some more in the Gujarat area. In the new offshore areas which we are exploring, there are hopes of having fairly large supplies.

We have also gone out of India and are drilling in the offshore areas of Iran. Since at one stage it was proposed to abandon drilling at 3,000 metres, the very fact that drilling is still continuing and has gone beyond 3,500 metres and may go to 4,000 metres suggests that something might be found. We cannot yet say anything definitely because oil is a very tricky business. One cannot be sure of oil till one has actually found it by drilling.

The Oil and Natural Gas Commission has done exceedingly well during recent months. Its exploration efforts in India are being intensified. In addition, we are exploring the possibility of joint enterprises with foreign collaboration wherever suitable terms are available. We are using contract drilling in appropriate cases for speedy exploration and exploitation of difficult and prospective offshore areas.

Once crude oil is produced by a Government agency in India or abroad, our aim is to secure full utilisation of such oil. Depending on the needs of the country, utilisation of our own crude will first be in the refineries fully-owned by Government. Where there is surplus, such crude is supplied to existing refineries and will be supplied to future refineries that may be constructed with foreign collaboration.

If Government can import crude oil at prices cheaper than those obtained by the private refineries, we shall ensure that the private refineries must either match these prices or accept the Government crude. In pursuit of this policy, we have been able to persuade the Phillips Petroleum Corporation to accept a reduction in the price of imported crude which will give us a saving in foreign exchange of almost a crore of rupees a year.

Again as a result of persistent efforts, private companies have in recent months reduced the price of crude oil twice. In

December 1964, the prices of light Iranian and light Arabian crudes were brought down by two cents per barrel, which meant an annual saving of about Rs. 20 lakh in foreign exchange at the present level of imports.

Discussions have led to further reductions from July 1, 1965 of a greater magnitude. The price of light Iranian crude was further reduced by seven cents and of Kuwait crude by four cents a barrel. The crude oil mixture in one of the refineries has been reduced by five and a half cents per barrel. Together these reductions will give a foreign exchange saving of about Rs. 2 crore per year.

Since May 1965, the supply of Ankleshwar crude to the Bombay refineries has been stepped up from 2,250 tonnes a day to 3,000 tonnes a day and will be further stepped up to 5,000 tonnes a day from January 1966. The increase already achieved has led to a foreign exchange saving of approximately Rs. 8.5 crore a year. These measures, therefore, add to a total annual foreign exchange saving of about Rs. 11.5 crore.

We have also been able to secure a substantial reduction in the price of finished products. Of this, the most recent and perhaps the most significant is an arrangement for supply of aviation petrol from a western source at a discount of nearly 24 per cent. This single transaction will save the country foreign exchange to the extent of about Rs. 1.5 crore.

It is Government's policy to create new refining capacity so that the country may be self-sufficient in as many petroleum products as possible. It has been and continues to be our policy that all new refining capacity shall be wholly Government-owned when the crude oil belongs to Government. There may, however, be need for collaboration arrangements so long as substantial foreign exchange costs are involved in refinery construction. We recognise that foreign collaborators provide finances for refinery construction only in the expectation of selling crude oil. Even in such cases, it is our aim to limit our commitments for purchase of crude oil to as short a period as possible and also to provide that such contracts do not conflict with the fullest use of indigenous crude or Government-owned crude.

As a further move towards economic independence in this field, we are taking steps to promote indigenous manufacture of refinery equipment as expeditiously as possible.

Our existing agreements with private refineries are under revision and it is our aim to replace such agreements with normal industrial licences. Negotiations to this end have made considerable progress.

Some of these refineries have been pressing for some time for an expansion of their capacity. This will have to be judged in the context of our programme for constructing refineries during the next few years. Our programme provides that before the end of the Fourth Plan practically every region in the country will have one or more refineries. Economics of transportation makes it clear that expansion of any particular refinery will then be justified only in the light of the demand in the relevant area of supply and this will apply to private refineries as well.

Our consumption of petroleum products is going up fairly fast. By 1971, the crude oil which we shall need may be of the order of about 27 to 28 million tonnes to give us finished products of about 24 to 25 million tonnes.

Our present refinery capacity in the country is about 8 million tonnes in the private sector and about 7 to 7.5 million tonnes in the public sector. It is the policy of the Government to see that the public sector becomes the dominant partner. Obviously we must build more refineries in the public sector to achieve this position. I expect that by 1971 almost two-thirds of the total refining capacity in the country will be in the public sector.

The Indian Oil Corporation has done exceedingly well in the recent crisis of local shortages of kerosene and diesel oil. It must, consistently with judicious investment of scarce resources, expand its marketing operations so as to control a major part of the business. We expect to achieve this position before the end of the Fourth Plan. Once this happens, IOC's relations with other companies will be placed on a sound basis.

In distribution, the Corporation has made really remarkable progress. Its total sale in 1962-63 was less than 6.5 lakh kilo-

litres, in 1963-64, about 11.70 lakh kilolitres and in 1964-65 it was 17.20 lakh kilolitres. In other words, the sale increased almost threefold in three years. Our target is 34.5 lakh kilolitres for 1965-66—an increase of almost hundred per cent in one year. IOC is already the second largest distributor in India. We surpassed Caltex some time ago. We have now surpassed ESSO. Burmah-Shell is the only company which has a larger distribution than IOC, and it is my expectation that within the next three years or so, IOC will be the single largest distributor in this country.

For some time now I have been thinking of some kind of national policy about retail distribution. At present there are too many pumps and sometimes one finds pumps of the same company within a few hundred yards of one another. Also, one sees clusters of pumps of different companies within very short distances. I am thinking of rationalising this and have given a hint to the private companies that this kind of indiscriminate multiplication of pumps will not be allowed in future. We are working out a policy so that there can be some kind of rationale in distribution and the pumps which belong to different companies have some ratio to the amount of petroleum products which they actually handle.

NATURAL RESOURCES

M. S. THACKER

INDIA'S RESOURCES of ground water, minerals and land are ample. Under the Plans, we have been giving attention to their development, and also to augmentation of such resources as are found to be deficient in relation to the nation's requirements. But much more is to be done. The present emergency underlines the need to make the country free from undue dependence on others,

Water is an important natural resource. Food production, pressure of industrial development, expanding population and the desire for security and higher standards of living demand that we devote greater efforts to rapid and efficient development of our water resources.

Ours is a predominantly agricultural economy, and the major use to which our water resources are put, and rightly, has been irrigation. But rapid strides are now being made in industrial development and problems of water supply for industrial use have already arisen in several industrial areas of the country. It becomes increasingly important that assessment be made of total water resources, surface and ground-water, and their use planned after taking a long-range view of the over-all requirements.

With the increasing demand for water in various developmental activities, ground-water sources have to be surveyed and investigated, besides readily available surface water. Even earlier also, need for ground-water exploration was recognised. In the pre-Plan period (1950-51), out of the total irrigated area of 51.5 million acres in the country, 14.7 million acres were irrigated by ground-water. This figure had increased to 16.7 million acres by the end of the First Plan and 18 million acres by the end of the Second Plan and is still increasing.

Two organisations of the Central Government, namely the Geological Survey of India and the Exploratory Tubewell Organisation of the Ministry of Food and Agriculture, are engaged in the ground-water exploration work. They have already proved about 37,000 square miles as ground-water-worthy and further work is in progress but it has to be greatly intensified.

Coal is one of the most extensively available natural resources of the country. Since its main competitor in the field of fuels is oil, of which a large component is at present imported, it becomes essential that ways should be found to utilise coal and its products wherever possible to substitute for oil and other materials required for defence and agricultural purposes.

The reserves of non-coking coal are large in comparison to that of coking coals. Future industrialisation of the country must also necessarily be based on utilisation of the non-coking coals. Integrated projects based on utilisation of the non-coking coals, as well as the smalls, should form the basis for production of most of the vital requirements of the country, namely fertilisers, chemicals, domestic fuel, metallurgical fuel for pig iron production in low shaft furnaces, and so on. Furthermore, one-third of the production of coal is in the form of fines and positive steps should be taken to utilise them for gasification and for the production of nitrogenous fertilisers. Certain breakthroughs in several of these lines have been made and large-scale investments are now required to develop the process to a stage of commercial application, so that it may meet both the emergency requirements and the requirements of long-term development of the country. The problem of fine coal preparation is paramount, as otherwise it goes to waste.

The intricate problem of cleaning and dewatering of the minus 1 mm size coals has reasonable chances of success. A breakthrough appears to have been achieved by which the small non-coking coals can be used for coke making for use in metallurgy. We must exploit this commercially at the earliest moment. In the interest of both the coal industry and agriculture, a process should be developed for its application on a large scale. Another necessary measure is the setting up of a cyclone furnace for

burning low rank as well as higher ash fuels; this will be of great significance to the coal and power generation industries.

The Geological Survey of India and the Indian Bureau of Mines are exploring the known deposits of copper, lead, zinc, etc., by drilling and searching for new ores. Some additional reserves of copper have been proved in the ancient workings in Bihar and Rajasthan. Because of the limited nature of known reserves of non-ferrous metals and consequent need to prevent heavy drain on foreign exchange we must resort to substitution of the important metals. Aluminium, of which, fortunately, we have large reserves, has a vital role to play in this matter.

To meet our shortages of metals we should change the pattern of our metal consumption by substituting what we have in abundance for what we do not.

We are seized of the problem of substitution of the scarce non-ferrous metals and headway has been made in the electric cable field. Copper is being replaced by aluminium in the manufacture of overhead lines and underground cables. Much greater efforts can be made in this direction.

A number of electric motor manufacturers have started using die-cast aluminium rotors in place of rotors with copper strips. This process of substitution can be extended to a number of other fields. Aluminium may also replace tin in steel containers. All-aluminium containers are no doubt more expensive than tin-coated steel cans; but the saving, in weight and salvage value, may compensate the difference in cost. A recent development is the use of aluminium cans in place of zinc in dry cell batteries. The use of zinc and lead in white paints can be avoided by substitution with titanium dioxide, a product from ilmenite which is available in plenty in Kerala and Madras. There is already a factory in Kerala which manufactures titanium dioxide. Its capacity is insufficient to meet the demand; it should be expanded not only for meeting the internal demand, but also for exporting the finished product instead of the raw material—ilmenite. Titanium indeed is the metal of the future, because of its unusual combination of properties—lightness, strength and resistance to

corrosion. Today it is increasingly being used in the aircraft, ship-building, engineering and automobile industries.

India's known reserves of tungsten are small, but enough to meet her present requirements for making her own tungsten steels. There are ample supplies of vanadium ore. Vanadium enables high-speed tool steels to better maintain their strength and hardness at high temperatures.

In U.S.S.R., nickel and tungsten demands have been kept low by replacement with more readily available manganese, chrome and vanadium, particularly for stainless steels, tank armour and artillery-barrel liners.

Steps are under way to exploit the Amjore pyrites, rich in sulphur, for the manufacture of sulphuric acid, which would reduce our dependence on imported sulphur. To the same end, it has been decided to concentrate on the manufacture of nitrogenous and phosphatic fertilisers without or with limited use of sulphur. The recently discovered deposits of fluorspar in Gujarat and Rajasthan should be developed to meet the demand for use as flux in steel-making and as raw material for manufacturing hydrofluoric acid, essential to the aluminium industry.

MINERAL SUBSTITUTES

<i>Mineral Commodity</i>	<i>Substitutes available in India</i>
Antimony	Titania, zirconia, plastics
Arsenic	Organic compounds
Asbestos	Glass fibres, synthetics*
Cobalt	Manganese, lead, iron
Copper	Aluminium, stainless steel
Diamonds	Synthetics, silicon carbide
Graphite	Synthetics
Lead	Plastics, aluminium, titanium, zinc, synthetic resins, magnesium
Nickel	Chromium, aluminium, manganese
Phosphate Rock	Basic slag
Platinum	Gold, other platinum group metals
Tin	Glass, paper, enamels, aluminium, zinc, plastics, lead
Tungsten	Titanium carbide
Zinc	Ceramics, plastics, aluminium, magnesium, lead, titanium

*Substitution is potential or experimental

**Substitution is of limited scope or inferior in performance.

Since the last World War, scrap metal trade has greatly expanded, thus preventing considerable wastage of metals. The scrap is derived from the processing and fabricating plants and also from discarded articles finding their way to junk-heaps. India, like other countries, should make increased uses of scrap for the conservation of metals. In U.S.A., for example, the amount of lead now produced from scrap is twice that of the mineral product. Of antimony, about 57 per cent is of secondary origin, being mostly derived from old automobile storage batteries.

Finally, India has exportable surplus of iron ore, manganese, ilmenite, bauxite, sheet mica, kyanite and sillimanite (for glass and refractory industries) talc (for special insulators), monazite (for atomic power), beryl (for fatigue-resistant copper and other alloys) and zircon (as oxide for radio tubes, etc., refractories and high temperature insulators; as metal, and in special steel alloys). These are of increasing importance in modern industries. We may, therefore, obtain from abroad supplies of other metals and materials which we lack in exchange of these.

There will be a sudden spurt of demand for construction timber, such as bamboos, poles, sawn timber and logs of small and large sizes. There will also be a demand for various timbers with specific properties for certain strategic uses. In the last war most indigenous species were tested and lists prepared of those which could be satisfactorily substituted for imported woods used for various purposes. We must take steps for determining substitute indigenous woods and also for their collection. The Forest Research Institute, Dehra Dun, and the Forest Departments of the States should be asked to come into this area with bigger help. Research will also have to be intensified to test the performance of various articles made from wood.

In so far as industrial products made from forest raw material are concerned, the most important is newsprint. Today the country is producing only 30,000 tonnes of newsprint per year, all in the Nepa Mills. As against this, the annual consumption is of the order of 125,000 tonnes. On the import of the balance requirements, a foreign exchange of nearly Rs. 6.2 crore is paid. The Government of India, I might mention, have decided to

double the production of the Nepa mills in 1966. Erection of additional equipment for this programme should be expedited. In regard to forest raw materials as a whole it could be stated that these are available within the country to tide over the emergency.

Plantation of quick growing, salt-tolerant bushes and trees suitable for saline and alkaline areas such as Wilayati kikar (*prosopis judiflora*), Babul (*Acacia arabica*), Oken and Farash (*Tamarix articulata*) may be taken up in saline and alkaline areas which are lying waste. This will augment our domestic fuel supply.

The total of culturable waste-lands in the country is about 20 million hectares. As much as possible of such waste-lands which can be put under crops should be cultivated and crops suitable to the areas grown. Agricultural waste-lands in the country are mostly held by small-owners who are not in a position to meet the cost of their reclamation. The reclamation of such lands may have to be subsidised.

There are areas with ravines and gullies which can be immediately reclaimed economically, and could be put to agricultural use. There are other areas which could be used for forestation and/or controlled grazing.

The Committee on Natural Resources of the Planning Commission has made detailed recommendations in respect of cotton, groundnut, coconut, jute and mesta, cashewnut and arecanut, and these recommendations, if followed urgently, should strengthen our agricultural base.

The Indian Ocean Expedition has estimated that only 1 to 8 per cent of the fish available along the Eastern and Western Coasts of India is being caught at present. In other words, the supplies of sea fish along the coasts of India could be increased 20 times if this resource is exploited fully, in the way in which it is exploited by the people of Japan, Great Britain or other countries of Western Europe. The supplies could be increased even more by adopting presently known methods of fish culture. The reservoirs in our river valley projects offer scope for (fresh-water) fisheries of great magnitude. What can be done in this

direction is demonstrated by the experience on the Tungabhadra Dam, where supplies of fish (for fish culture) have increased within a few years from 700 pounds to 300,000 pounds. Some of the slower moving rivers offer good possibilities for culture of algae, which are rich in protein food.

A large quantity of urban-waste still remains unutilised and much sewage and sullage are discharged into rivers and streams causing pollution of water. By efficient utilisation of urban waste we can not only grow more vegetables but also strengthen the agricultural potentiality of the country.

About 8.4 lakh tonnes of basic slag are produced annually from the Indian steel plants which contain 45-48 per cent lime and 2-5 per cent phosphates. This waste material, if finely powdered, will be a valuable ingredient for liming acid soils which form about one-tenth of the cultivable area. The difficulty of making this slag available in finely ground form can be solved by installing powdering plants near our steel plants.

If one were to enumerate briefly some other uses of materials now being wasted : blast furnace slag can be profitably used for augmenting the manufacture of cement; by-products of coal can be used in the manufacture of toluene and other organic compounds which are vitally needed for defence industries; minor non-edible oilseeds like *mohua*, neem, *karanj*, *undi*, etc., can be utilised to increase the production of soap and cosmetics and also to relieve the rising pressure of demand on the edible oils.

One can quote several such uses of materials which are otherwise going to waste. These will not only feed our economy but also make us more and more self-supporting. For, if any lesson is to be learnt from this emergency which has been forced on us when we were amidst our endeavour for development, it is that we should rely on ourselves.

THE RAILWAYS' QUEST FOR SELF-SUFFICIENCY

KRIPAL SINGH

THE MASSIVE EFFORTS made by the Indian Railways in the wake of Independence were based on the knowledge that the key to their progress lay in the building up of a domestic rolling stock industry in the quickest possible time.

It was a sick railway system that India inherited after Partition with rolling stock badly dilapidated due to the economic depression of the '30s followed by the ravages of the Second World War and the crippling effects of Partition. The tasks of rehabilitation and replacements were onerous in themselves; added to these was the problem of putting more rolling stock on the line to cope with the rapid increase of traffic under the stimulus of Five Year Plans.

The foremost consideration in the expansion schemes of the railways was, therefore, given to the setting up of production units for the manufacture of rolling stock. The first to be established was the Chittaranjan Locomotive Works in West Bengal for the manufacture of steam locomotives. This was followed by the Integral Coach Factory in Madras set up for the manufacture of passenger coaches. In the light of modern trends in motive power, the manufacture of electric locomotives has also been started in the Locomotive Works at Chittaranjan, while a new factory is coming up at Varanasi in Uttar Pradesh for the production of diesel locomotives. The requirements of wagons are being fully met largely by production in the private sector supplemented, in the recent past, by manufacture in certain railway workshops.

The emphasis on self-sufficiency has led to one of the most notable achievements of Railways in the post-Independence period. Apart from helping in saving valuable foreign exchange, the drive towards self-sufficiency has given a big fillip to indigenous industry, the acquisition of valuable technical know-how and the perfection of production techniques. The production units of the Indian Railways have made significant progress. Efficient techniques have facilitated a continuous improvement in out-turn with progressive reduction in costs and the undertaking of more difficult items of manufacture. These units have proved that in technical skill and productivity the Indian worker is second to none and has the capacity to adapt himself quickly to new techniques.

Although the question of manufacture of locomotives had been considered in the past, effective steps in this direction were taken only after Independence. The present site in Chittaranjan was selected after a fresh survey, keeping in view the availability of water and power supply from the nearby Ajoy river, the Maithon dam and the hydel power station. Construction started in 1948 and the township and factory were completed in less than three years within the sanctioned estimate of Rs. 14 crore. Production was launched on the day India became a Republic—January 26, 1950. On November 1, 1950, the first steam locomotive was driven out of the assembly lines by President Rajendra Prasad.

To begin with, the production target was set at an annual outturn of 96 WG locomotives to be achieved by 1954. This was raised to 160 WGs in 1957. These targets have been consistently surpassed. With the rapid strides in electric traction, the need arose for the manufacture of electric locomotives within the country. This was undertaken at the Chittaranjan Locomotive Works and provision of additional workshop space and special plant and machinery at an estimated cost of Rs. 2.26 crore is on hand. Even with the existing facilities, a start has been made with the manufacture of electric locomotives.

In the first fourteen years of its existence, the Chittaranjan Locomotive Works produced 1,691 steam locomotives, 21 DC

electric locomotives and two AC electric locomotives. It is scheduled to turn out 153 steam locomotives and 27 AC electric locomotives during 1965-66.

In the light of the decision for progressive transition from steam to electric and diesel traction on our Railways, it has been decided gradually to taper off the production of steam locomotives at Chittaranjan during the Fourth Plan to convert the workshop for the manufacture of electric locomotives, including traction motors and ancillaries. Work is already in progress for the provision of additional facilities and specialised equipment for the changeover. In the coming year, Chittaranjan is expected roughly to double the electric locomotive production while continuing with large-scale steam locomotive manufacture as well, making in all approximately 200 steam and electric locomotives.

Outturn in the Chittaranjan steel foundry, which went into production in November 1963, has reached about a third of its ultimate capacity of 10,000 tonnes per year. The foundry is now providing steel castings for steam locomotives and is programmed to take on, in the near future, castings for electric and diesel locomotives as well as manufacture of manganese steel track crossings.

The Integral Coach Factory, one of the largest coach building units in the world, was set up at a cost of Rs. 7.35 crore to attain self-sufficiency in passenger coaches. Production was inaugurated by Prime Minister Jawaharlal Nehru on October 2, 1955. Since then the Factory has not only exceeded the output targets but also diversified the production. A furnishing unit at a cost of Rs. 3.69 crore has since been added to the Factory.

The integral coach, the most modern in design, embodies three major factors for ensuring comfort and safety to the travelling public, namely smooth running, light weight and strength. The design incorporates an all-welded trough floor, integral with the body, which enables the working forces sustained by the coach to be borne by the entire body including the skin. Another important feature is what is known as anti-telescopic end cons-

traction, which reduces the possibility of the coaches telescoping in the event of an accident. Though an all-steel coach, the integral coach is much lighter and weighs only 35 tons as against the conventional coach which weighs 42 tons, a factor which makes for several operational advantages.

Beginning with the assembly of a few coach shells from imported components, the factory, working single shift, reached its full production rate of 350 coach shells per year in 1958-59, a little more than a year ahead of schedule. With the gradual introduction of second shift working, the annual production rate has since been stepped up to 600 coach shells.

In ten years, the Integral Coach Factory has turned out over 4,000 coach shells and furnished over 2,000 of them. Production in this factory has been diversified to cover, in addition to third-class coaches, other types of coaches like luggage and brake vans, two-tier and three-tier third-class sleepers, first-class coaches, first and third class composite coaches etc. It has also turned out broad gauge AC electric multiple-unit coaches and metre gauge passenger coaches and is programmed to build metre gauge E.M.U. coaches, diesel rail cars and broad gauge coaches for the new air-conditioned express trains.

The total holding of diesel locomotives on the Indian Railways at the end of the First Five Year Plan was only 67—47 on B.G. and 20 on M.G. During the Second Plan, main line diesel traction for carrying through freight services was introduced as a prelude to electrification on the congested routes of the Eastern and South-Eastern Railways, to cope with the rapid build-up of coalfields and steel plants traffic which was beyond the capacity of steam traction. In the Third Plan, the concept of long-distance haulage by diesel traction of the heavy freight trains, particularly those carrying coal and ore and some long-haul general goods, has been extended to several important routes which were fast approaching saturation with steam traction.

While the immediate requirements of diesel locomotives have been met from time to time through imports, the setting up of indigenous manufacturing capacity for such locomotives has been taken up as a matter of urgent necessity and a production unit,

the Diesel Locomotive Works, for turning out diesel locomotives is rapidly coming up at Varanasi. The factory has already assembled 12 diesel locomotives from imported sub-assemblies and turned out four with chassis and superstructure fabricated at the factory. Manufacture of the diesel engine is to be commenced in 1966 to coincide with receipt of the electrical equipment from Bhopal and the indigenous content of the diesel locomotive is expected to rise rapidly to about 90 per cent in the latter years of the Fourth Plan.

All mechanical signalling equipment is now being manufactured indigenously. Some components of electric signalling are also being manufactured in the country and there are plans for a good deal of expansion in this field. A decision has been taken to set up a Central Signalling Workshop of Indian Railways to manufacture modern electric signalling equipment which may go into production early in the Fourth Plan.

Through sustained efforts, a considerable increase has been made in the indigenous manufacture of all kinds of railway equipment, including track materials and bridge girders. This has resulted in a steady decrease in the purchase of imported materials from 30.03 per cent of total railway purchases in 1951-52 to 14.7 per cent in 1962-63 and 12 per cent in 1963-64 with consequent proportionate saving in foreign exchange.

The Development Cell of the Railway Board whose main task is the development of indigenous capacity for railway equipment functions in close co-ordination and liaison with the Department of Technical Development and other Government departments and with the representatives of the industries concerned. Steps have been taken to develop adequate capacity in the country for a number of additional rolling stock components including ancillaries and spare parts required for diesel and electric locomotives and electric multiple units, as well as overhead traction fittings.

Copper and aluminium conductors and catenary wires and fittings are entirely being manufactured in India out of imported electrolytic copper bars and cadmium. Out of the three sizes of steel tubes used in bracket assemblies, one is indigenously

manufactured and trial rolling of tubes is being done in respect of the other two with a view to developing indigenous production. Considerable progress has been made in the development of solid core insulators and it is expected that railway requirements will be met shortly by indigenous production. Regulating equipment has been developed by local firms with the exception of stainless steel wire rope and certain types of ball bearings.

The progress made in regard to indigenous development of overhead equipment will be evident from the progressive reduction effected in the foreign exchange element. In 1958, the total cost of imported components and materials (other than raw materials) was about Rs. 24,000 per km. of single track; this now stands at about Rs. 2,200. Remote control equipment is manufactured by the Indian Telephone Industries, Bangalore, only a few raw materials and components being imported. A collaboration agreement has been entered into with a consortium of reputed Continental firms for the manufacture of electrical equipment for 25 KV AC freight locos. All the equipment required for train-lighting, namely dynamos, switch-gear, batteries, junction boxes, kent couplers and cables are being manufactured locally. Indigenous capacity has also been developed for the supply of various other equipment like drivers, desk equipment, pantographs, air-blast circuit breakers, air-compressors, air-brake equipment, transformers, silicon rectifiers and batteries and other accessories.

The Indian Railways occupy an important position as the first and foremost nationalised undertaking in the country. By sustained efforts, they have not only made considerable progress in the drive towards self-sufficiency but are also building up considerable potential for an export market.

PRIORITIES IN POWER

H. R. BHATIA

ELECTRIC POWER is a basic necessity for achieving industrial and economic development. Since our defence efforts will also depend largely on industrial backing, the steady development of electric power and efficient maintenance of this service become all the more important from the defence point of view. Our manufacturing capacity for large electric power plant and prime movers, both in the hydel and in thermal fields, is still very limited and we depend on imported equipment to a large extent. No doubt, the Heavy Electrical Factory at Bhopal and the other factories being set up by Bharat Heavy Electricals have covered some field, but even these factories depend largely on imported components and designs, and until we cover the entire field, our power development programme cannot stand on a firm footing. Our requirement Number One is, therefore, to achieve self-sufficiency over the entire field of design and manufacture of electric power plant as quickly as possible. It is not necessary for this purpose to cover all varieties of electrical equipment. To begin with, we should select and standardise a few types of equipment to meet the essential needs and concentrate efforts to reach technical self-sufficiency in the design and manufacture of these items. Priority should be given to items of equipment for which there are no indigenous substitutes. Thus, equipment for electric traction should have a second priority compared to power plant equipment, as the former has a substitute in the form of steam traction. Not that the manufacture of equipment for electric traction should be ignored, but the relative priorities must be determined in a rational manner and firmly observed as a

guideline. Rapid development in the indigenous production of insulating tapes and varnishes, insulating paper, substitution of aluminium conductors in place of copper in the manufacture of electrical machinery to the extent possible, manufacture of high-tension cables up to 33 K.V. are other items which need concentrated attention for the next few years to achieve a greater rate of progress towards self-sufficiency than heretofore. The existing administrative machinery to supervise the production in these lines should be strengthened where necessary.

Our financial and material resources being limited, the next important consideration that should receive our constant attention is to plan new power schemes in such a way as to achieve maximum benefits with minimum outlays. Thus, if the same benefits can be achieved by adding a unit or units in an existing installation in the region as a whole, proposals for the development of a new power site should not be entertained.

The idea of power development on a regional basis irrespective of state boundaries has already been widely accepted in the country and there is need for a rigid adherence to this policy. Interconnection of hydro and thermal stations in a large grid offers many advantages of increased firm power and economies in operational charges, and this arrangement should be developed to the maximum extent. Large amounts of secondary power available in almost all hydro power schemes can be utilised in this manner. In multi-purpose river-valley schemes, the pattern of water releases at present in vogue may be reviewed to give greater power benefits without loss to irrigation, which should be possible in some cases by adopting carry-over operations from a wet to a dry year.

New thermal stations should be planned only on sites which offer advantages for development into super-power stations in the future to meet regional needs. Except at sites near coal washeries, where super-power station capacities may develop up to 2000 M.W. and more, some compromise will be necessary between operational economy and security of supply in determining the optimum capacity of super-power thermal stations. It is felt that on an average thermal station capacities of about

500 M.W. may give optimum results, including economies of transmission. In special circumstances of highly concentrated load centres, the capacity at a single site may increase to 750 M.W.

One of the main aims of the Indian Electricity Supply Act of 1948 was to rationalise power generation in a fewer number of large power stations and eliminate uneconomic power generation in small thermal power stations installed to meet local needs. In spite of this guiding principle small thermal generating sets, mostly diesel, had to be imported into the country in the last few years in view of the acute shortage of power in some States. It is necessary that the import of such sets for public supply undertakings should ordinarily not be permitted in future. Some States are understood to be encouraging the installation of small diesel generating sets by industries for running their individual industries, by promising subsidy, in capital costs as well as in running costs, so as to equalise the running costs with supply rates from the power system. Such policies obviously run counter to the objectives of the Indian Electricity Supply Act and should be discouraged. Instead, such resources can be pooled to install a bigger and more economical central power plant.

Efficient upkeep and maintenance of existing power systems is of the utmost importance in the present conditions. All power stations and major grid sub-stations, where costly equipment is installed, should be placed in charge of sufficiently trained and experienced personnel of proper status who should be adequately remunerated. Maintenance staff should be provided even on a somewhat liberal basis and no false economies should be attempted in this matter. Every large power system should have a high-level maintenance engineer who should prepare routine maintenance schedules and ensure by regular inspections that these schedules are strictly observed. System protection and its efficient maintenance is another subject requiring specialist supervision and there is need for strengthening the power organisations in this direction also. Essential spares must be stocked to prolong the life of the equipment as much as possible. Besides,

local skill has to be built up to carry out repairs with locally available material in emergencies.

Quality of service is another important matter requiring substantial improvement over the existing standards in almost all power systems in the country. Interruptions in supply which were tolerated by the public a decade or two ago are now a source of serious irritation because of the increasing dependence of the public on electricity. The economic effects of such interruptions are also much more marked now than a decade or two ago. Maintenance of proper standards of voltage is also largely lacking and requires improvement.

The design of power systems has, therefore, to be reoriented to achieve these improvements. Most of the existing power systems were designed and constructed when the supply conditions were very much less rigid and financial returns expected were low. The systems were therefore planned with a view to cheapness. High reliability overhead lines will naturally cost more. Proper sectionalisation of these lines by automatic switch-gear, which is lacking at present, will also add to the cost. Duplicate feeds are necessary for more important localities. For proper voltage regulation, power transformers on all grid substations on a large power system will need transformers fitted with on-load tap changing gear. Protective equipment on distribution systems will also have to be more elaborate and efficient.

These improvements will require fixing up new norms of cost to replace old norms and the sooner new norms are adopted the better. In the ultimate stage, it will be necessary to replace all high-tension distribution lines (up to 33 K.V.) in all urban localities underground. It will be desirable, however, to spread out such conversion over a number of years to avoid strain on our foreign exchange resources as these cables have to be largely imported at present. The position is expected to improve substantially in the next five to ten years.

A subject much talked about at present, which is receiving a great deal of support from all quarters in the country, is rural electrification. India is predominantly a country of rural people and it is, therefore, but appropriate that rural areas receive the

benefits of modern development in a fair degree as quickly as possible. Availability of electric power in rural areas will also step up food production.

To obtain optimum results, however, rural electrification programmes need careful planning and co-ordination. While the rural public will readily take to utilisation of electric power for ordinary uses like irrigation pumps and rice and flour mills, the economics of these distribution systems will be better served by multiplicity of power uses, and planned efforts are necessary to achieve this objective. At present the emphasis is generally laid on the number of villages electrified and not on the extent of utilisation in each village. It is desirable that in all our future plans more emphasis should be laid on the latter aspect.

In the Fourth Plan specific provision has been made by the Planning Commission for developing agro-industries. Adequate technical guidance will have to be provided to the rural public to develop such industries and a suitable organisation built up in each State for the purpose. Unless this is done, the progress may not be adequate.

Before I conclude, I should like to add a short note on the organisational aspect of the power set-up in the country. There is need for strengthening these organisations so as to be able to take up larger programmes of development in the future. A State Electricity Board has been formed in each State under the provisions of the Electricity Supply Act of 1948, to work as a semi-autonomous body under the supervision of the State Government. Most of the State Electricity Boards are now huge organisations controlling large blocks of capital expenditure and revenues. It is very essential that the members appointed on these boards have sufficient experience and background of technical and commercial undertakings so as to run these undertakings successfully. They should not be appointed indifferently or on political considerations as is being often done at present.

In some cases there is still a lack of complete understanding and co-ordination between the Board and the State Government. This is detrimental to the successful working of these organisations, and progress suffers. State Electricity Boards depend

wholly on the State Governments for financing capital expenditure as per provisions of the Electricity Supply Act. There is need to review the provisions of the Electricity Supply Act in this regard so that at least a part of the development could be financed from the revenues of the Board, but until this is done, a better understanding is necessary between the State Governments and the Boards.

Some of the State Governments have raised the rate of interest on the capital blocks advanced to the Boards to an unnecessarily high level without consideration to the revenues. It becomes all the more difficult for the Board to pay when it is not allowed by the State Government to adjust its tariffs suitably to meet these enhanced obligations. There is obvious need for adopting rational policies to develop these new organisations on a sound footing.

The Electricity Supply Act of 1948 also envisages the setting up of a Central Electricity Authority in the country, and although such an authority has been in existence for a number of years, it is an *ex-officio* body and not an effective authority as envisaged in the Act. There is need for a strong Central Electricity Authority working as a semi-autonomous body on commercial principles for supervising and directing all electrical developments in the country. The functions of this authority should be enlarged so as to undertake central generation in super-power stations built to meet regional needs apart from individual State enterprises. It is only then that it will be possible to meet the rapidly rising demands for power in the country.

IMPORT SUBSTITUTION

T. N. SRINIVASAN

SUBSTITUTION OF IMPORTS by domestic production has been one of the essential strategies in our development plans. The adoption of such a strategy has been dictated by a number of important considerations, the most important of which is a desire to achieve a progressive reduction in the dependence on foreign assistance. The Memorandum on the Fourth Five Year Plan prepared by the Planning Commission puts it this way : "The bulk of our imports, apart from food imports, consists of petroleum products, crude oil, metals, chemicals, machinery and equipment. These commodities will be required in increasing quantities as the economy grows in size and complexity; and, unless deliberate attempts are made to enlarge their domestic production, there can be no escape from large-scale dependence on foreign loans and grants."

The Planning Commission comes to this conclusion after making generous allowances for the possibilities of larger volume of foreign exchange earnings through expansion of exports of traditional as well as non-traditional items. Thus, if the strategy of import substitution in key sectors of the economy is not followed, either we have to scale down our Plan to keep our import requirements within the limit of our export earnings and a reasonable inflow of foreign assistance or maintain the Plan size and try to obtain a massive inflow of foreign assistance. It is obvious that neither of the two alternatives is acceptable—the first because any scaling down of an already modest Plan will mean a postponement of the time point by which the bulk of our population can be provided with the basic needs of life, the second

because of its political implications such as the enormous power that some large donor countries may acquire over our economic and foreign policies. I shall come back to this point later.

It is sobering to look at some of the magnitudes involved. After all, as Dr. Johnson put it "...A thousand stories which the ignorant tell and believe, die away at once when the computist takes them in his grip." Let us examine the implications of maintaining till 1970-71 the same ratio of imports to domestic production as in 1965-66 in just three sectors: Machinery, Steel and Fertilisers. Calculations based on such an assumption will indicate the consequences of abandoning the strategy of accelerated import substitution implied in the Fourth Plan proposals. The figures are as follows:

TABLE 1

	Domestic Production ¹ 1965-66	Imports ² 1964-65 1965-66	
1. <i>Machinery</i> : (Rs. crore)			
Capital goods	563		360
Consumer durables	141		
Intermediate goods	231		140
Total	935	473	500
2. Iron & Steel (Million tonnes of finished steel)	5.3	1.2	1.2
3. Fertilisers Million tonnes)	0.50		0.40

¹Source : *Fourth Five Year Plan, Resources, Outlays and Programmes*, prepared by Planning Commission for N.D.C. Meeting of September 5-6, 1965.

²Import figures for 1964-65 are based on data from *Reserve Bank of India Bulletin*, July 1965, and average price data obtained from Perspective Planning Division of the Planning Commission. Figures for 1965-66 are author's estimates. Imports of machinery under intermediate goods cover imports of components and parts. This figure was estimated as 20 per cent of the value of domestic production of finished capital goods and consumer durables.

Having established the factual position in 1965-66 let us do some projections. Corresponding to the now accepted figure of Rs. 19,000 crore of net investment for the entire Fourth Plan, the gross investment in 1970-71 (the final year of the Plan) is likely to be around Rs. 5,500 crore.¹ Investment of this order will require Rs. 1,650 crore of finished capital goods at ex-factory prices. If the ratio of imports of finished capital goods to domestic production remains the same as in 1965-66, we shall have to import complete machinery to the tune of Rs. 650 crore in 1970-71. Adding to it the imports worth Rs. 250 crore of components and parts we get a figure of Rs. 900 crore for imports in 1970-71 under the head Machinery and Parts.

We estimate the requirements of finished steel in 1970-71 to be around 10.2 million tonnes. This figure was arrived at by using the data on Material Balances for Steel contained in Perspective Planning Division's *Notes on Perspective of Development: India 1975-76*, after making appropriate adjustments for lower total investment and lower total machinery output implied in our calculations as compared to those of Perspective Planning Division.

The projected consumption of chemical fertilisers in 1970-71 is 3 million tonnes. Applying to this the ratio of imports to domestic production prevailing in 1965-66 we get a figure of 1.33 million tonnes as imports of fertilisers in 1970-71.

The picture that emerges under the assumption that 1965-66 ratio of imports to domestic production will prevail in 1970-71 is on the next page.

¹In order to be strictly consistent with our hypothetical assumption of no acceleration in import substitution during the Fourth Plan, we must scale down the official total investment figure. For, this figure includes investment for faster import substitution in machinery, steel, etc. Even though such a scaling down of total investment will reduce the figures for imports reported in Table 2, the author believes that the reduction will not be substantial enough to invalidate the case for import substitution.

TABLE 2

	Domestic Production	Imports	
		Quantity	Value (Rs. crore)
1. Machinery (Rs. crore)			
Capital goods	1000	—	650
Consumer durables	250	—	—
Intermediate goods	400	—	250
Total	1650		900
2. Iron & Steel (Million tonnes of finished steel)	8.3	1.9	170
3. Fertilisers (Million tonnes)	1.7	1.3	140
		Total	1210

It will be noted that our assumption involves a substantial increase in the domestic production in 1970-71 of Machinery (76 per cent), Iron and Steel (57 per cent) and Fertilisers (240 per cent) over their 1965-66 levels. However, even with this increase we need to spend in 1970-71 foreign exchange worth Rs. 1,210 crore on imports of just these three items. Compared to this figure, the projected total foreign exchange earnings from exports in 1970-71 is only Rs. 1,110 crore. It goes without saying that when we add foreign exchange requirements for imports of essential raw materials and products (such as raw cotton, raw jute, chemicals, non-ferrous metals and petroleum products), defence needs, debt service and food imports the foreign aid required in 1970-71 will far exceed the current level of about Rs. 500 crore per year. We, therefore, reach the inescapable conclusion that accelerated import substitution is essential if we are to achieve our goals of economic development without massive inflow of foreign assistance beyond the Fourth Plan.

It was mentioned earlier that excessive dependence on imports of essential items and on foreign assistance confers on foreign

countries considerable power over our political and economic policies. This power becomes particularly dangerous when it gets exercised over matters of national survival such as our defence. Even though in the past few years we have substantially increased our own production capacity in relation to defence needs, we still depend on imports for vital items such as aircraft, electronic detection and guidance systems for our Air Force, ships for the Navy, and armour for our Army. The recent action of some of the supplying countries in imposing an embargo on defence shipments to India clearly demonstrates the need for import substitution in this matter. It was implied in the U.N. Secretary-General's proposals that economic sanction should be applied against India and Pakistan if they did not come to a settlement of the present conflict. These sanctions presumably apply not only to imports of defence needs but also to our other imports. Thus considerations of national defence reinforce our arguments for accelerated import substitution during the Fourth Plan.

These arguments should not be taken to imply that import substitution should be pushed ahead with no consideration being given to the economic implications. The aim is not to move towards autarky. In determining the pattern and extent of import substitution and export promotion, economic analyses to identify in what products our long-run comparative advantage lies etc. must be undertaken. However, a discussion of this question is outside the scope of the present article.

MANPOWER IMPLICATIONS

B. N. DATAR

VARIOUS ASPECTS of the defence effort of the country and the need for self-reliance in each of them are being currently discussed. A corollary to this discussion will be the manpower preparedness for self-reliance. Since this preparedness has to run through the whole of the country's defence effort, and to a large extent the developmental effort too, it would be appropriate to examine its implications in different sectors, particularly in view of the fact that the recent conflict with Pakistan has shown that it is the human element which decides the turn of events. A costly lesson learnt by Pakistan is that superiority in equipment is of less consequence than a thorough training in the use of somewhat less sophisticated defence armour.

Fortunately for India the importance of the manpower aspect of planning was recognised early enough. Over the last ten years, attempts at understanding different facets of manpower preparedness for development are being intensified simultaneously with increasing the supply of technical personnel in the economy. However careful the analysis, experience everywhere has shown that supply of personnel in technical categories is always short in relation to demand. The best course open, therefore, was (a) to see how the situation could be kept constantly under review, and (b) to decide on timely steps to be taken to meet possible shortages. This twin task was being performed by the Manpower Directorate set up by Government and the various groups set up by that Directorate to support its work. Efforts were made all the time to maintain close liaison between the agencies dealing with supply and demand. In the emergency faced by the country

in 1962, an arrangement was made by Government through the high-power Technical Manpower Committee set up by the Cabinet to keep under review the plans and programmes for training of technical and other specialised personnel; to initiate action to strengthen such programmes wherever necessary; and for recommending introduction of accelerated training courses for personnel in different categories demanded by the emergency. The revival of the Technical Manpower Committee almost simultaneously with the emergence of the present conflict, therefore, augurs well for the future. The work of the Technical Manpower Committee set up earlier will now require a new orientation in view of the emphasis on self-reliance. Current thinking on self-reliance in different sectors as reflected in the various contributions to the special number of *Yojana* requires to be tied up with manpower needs in these sectors. In what follows no attempt will be made to estimate the numbers required. A broad idea of the type of personnel likely to be in demand will be given.

In discussing the prospects of self-reliance in agriculture, various steps have been indicated by the Prime Minister in his recent broadcast. He referred to what every individual in the country should do to conserve food as also to grow more of it, emphasising at the same time that the technical help needed for this purpose will be available through the agencies set up or proposed to be set up by Government.

The significance of this announcement is that Government will expand its current arrangements for technical advice, which in turn means that apart from making a more efficient use of technical personnel in this area many more soil scientists, agronomists, horticulturists, animal husbandry experts, etc., will have to be inducted into the campaign of intensifying programmes of agricultural production.

The other aspect of self-sufficiency in agriculture is the conservation and efficient utilisation of food supplies. While the former will require better arrangements for storage of production, freeing it from insects, rodents, plant diseases, etc., the latter will mean an intensification of educational effort to get the maximum nutrition out of available production. In either case the excellent

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work done in research institutions and nutrition laboratories requires to be spread adequately to urban and rural areas. This will be the task of extension services which again require diversified technical personnel in adequate numbers.

Various steps have been indicated to make the country self-reliant in agriculture—use of irrigation waters, soil conservation, multiplication of better seeds, use of fertilisers, improving the efficiency of agricultural implements, improvement in administration of credit, distribution and transport and the like. All these tasks require trained personnel. Even the emphasis on discipline and clear policy for procurement and distribution which is required for the assertion that “We *can* live with the food we grow”, also has in it important elements of manpower preparedness.

The second primary sector of production, viz. mining, covers an equally wide range of personnel requirements. India has ample resources of coal, the leading mineral with its multifarious uses. In efficient hands these uses can be enlarged; a nucleus for research in coal utilisation has already been in existence in India for some time. Self-reliance in this sector will mean intensification of the work done in fuel technological laboratories and, what is more, the spread of the results of these researches among the actual users.

What has been said about coal will also apply to other minerals available in the country. In an emergency, substitution of essential minerals normally imported by those available in the country and others which may require further exploration and exploitation becomes important. In terms of personnel, this means that on the one hand scientists, metallurgists, technologists will be required for perfecting substitutes available in the country against different scarce imported minerals as also geologists for further exploration.

To the same area belongs the exploration of mineral oils. Considerable expansion has taken place in oil exploration within the country, but of even greater significance is the fact that expertise in this line has been developed in a relatively short period and is being utilised in other countries through our personnel.

However, exploration of oil by itself will hardly be sufficient unless it is matched by indigenous capacity for refining mineral oil. Self-reliance in this area necessarily implies promotion of local manufacture of refinery equipment which has different personnel implications particularly in categories like chemists, chemical technologists, technologists, and engineers of all descriptions.

In the industrial sector, mainly as a result of the emphasis in the Second and Third Plans on development of basic and heavy industries and the recent thinking on "machines to produce machines", the manpower problems have acquired a new meaning. Over the last eight years this work has been done with the assistance of foreign collaborators in steel, machine-building and fertiliser factories. This experience has been of considerable value to Indian talent in producing final products and in setting up new plants.

The substantial benefits which we have derived by setting up public enterprises and by acquisition of vast know-how which is essential for self-reliance are well recognised even by the critics of public enterprises. Initially, industries, whatever their label, must give up their reliance on imported spare parts and substitute locally produced materials for a wide range of raw materials currently imported. This was done in India at a less sophisticated level in the Second World War. Industries did not come to a standstill mainly because of the capacity of indigenous designers to provide substitutes and more importantly by the encouragement which they got through users of these substitutes. All this again will require a large measure of engineering, scientific and technological talent.

Defence production has made significant progress in this country in recent years. Modern armament technology, it is said, is developing so fast that many of the items get obsolescent even while they are on the drawing board. This only brings out more pointedly the importance of developing design and consultancy agencies over a large area of defence and industrial production. In an emergency of the type the country is going through today, the needs of defence and development will indeed be complementary; and the same is true of the needs in terms of tech-

nical personnel. What becomes essential, therefore, is that there has to be an enlargement of the base from which the country has to draw upon its technical personnel.

In the transport sector also a fair measure of self-reliance has been built up over a period of years. Technical acumen in this field is not lacking because of the conscious effort for developing personnel. This is particularly true of Indian Railways where an attempt has been made in almost every department towards self-reliance. Nor is the complementary aspect of self-reliance, namely development of export markets, ignored. It is really when men are confronted with a crisis that they accept more responsibilities, they seek room for experimentation and, what is more, in the Indian context, they show desire for devolution of authority. It is all these forces which help in the building up of technical personnel for self-reliance.

In the context of defence, medical attention not only to those who are on the front but also for those whose hearths and homes they protect, requires attention. Considerable progress has been made in recent years to enlarge our reservoir of medical personnel though in some of the auxiliary categories shortages have been more acute. Thinking on the Fourth Plan has been on the generous side but it is yet uncertain as to what shape the proposed arrangements will take. Morale of the public is as important in an emergency as that of the defence forces. In fact, the support behind the lines was of considerable significance in what the armed forces have been able to achieve in the recent conflict. This aspect will have to be kept in mind in formulating future schemes in social services of all descriptions. Self-reliance in social services, however, does not have any special manpower implications.

The manpower problem of self-reliance not only touches the specialised categories of engineers, chemists, scientists, technologists, doctors and skills allied to these disciplines but also extends to different areas of administration. Essentially it is organisation that counts. Development of organising abilities is possible in persons with other educational disciplines also; in fact the present cadres of administrative and defence personnel belong mainly to

what may be called non-technical categories in terms of their basic qualifications. There is thus no educational discipline which can suffer neglect in relation to the requirements for self-reliance. But in terms of priority it is likely that the technical group will have a favoured position in expansion of facilities for building up the defence and developmental effort.

In many areas where self-reliance has to be achieved, experience becomes important. It is emergency which provides such experience because experimentation is permitted on a large scale. With shortages all round in technical and other categories new talent which would have otherwise remained unutilised gets introduced into the economic system. When such men and women see that they have a chance to make their contribution and their early faltering steps are accepted as a part of the bargain for self-reliance, they will themselves acquire a confidence which will make their steps firmer. If improvisation of substitutes is to be tried out over every area, it is expected that this will be also practised in the field of technical manpower. How to do this is indeed the task of the Technical Manpower Committee.

DEVELOPMENT RESEARCH

P. R. GUPTA

ONE SCIENCE FICTION assiduously cultivated is the inevitability of progress through research. This has resulted in a crop of half-baked theories, propagated with courage even though their results are frustrating.

Three of the more popular theories that keep popping up are : 1, that a mere increase in the research budget will lead to El Dorado; 2, that the mere presence of scientific equipment in modernistic laboratories will bring home the bacon; and 3, that the mere presence of an increasing number of scientists, technologists and engineers will erase poverty, ignorance and disease.

Two kinds of people who do not necessarily help the application of science to industry are the industrialist who, seeking status symbols, proudly exhibits his testing laboratory as his research department; and the zealous scientist who regards basic research as the only true form of research.

The conflict with Pakistan and China has brought into focus the need to achieve self-reliance in various sectors of our economy, particularly agriculture and industry. One sure way of achieving it is through speedy application of scientific research. Our watchword should be the sentence that used to be the favourite of the British physicist, Lord Kelvin : "I have thought of a better way."

But research in itself need not necessarily be the first priority in any plan for immediate increase in the national economic productivity. For industrial growth, men, material, money, market and management are equally important. Some have suggested

that the role of the inventor is like that of the clock-winder. Those who disagree with this view contend that the key factor is the management decision to invest in technical innovations which transform research results into a commercial reality.

If science is to promote the country's industrial development, what is required is Government initiative in creating a live link between the inventor and the industrialist.

Attempts have been made in different parts of the world to identify the conflicts and contradictions that come in the way of speedy application of research results in industry.

For measurable industrial progress, what is essential is to be first in the field of application of science which is of greater advantage to a country than to be the birthplace of the discovery. This has been well demonstrated in Japan and Germany. For instance, Germany's royalty payment per year for the use of foreign patents doubled between 1957 and 1963, increasing from Rs. 40 to 81 crore.

Whatever the scale of research, it will have no perceptible impact on industrial development until the innovation process is completed. Whereas invention is the creation and development of a new idea, innovation is the act of bringing it into practical use. Between invention and innovation is a wide distance, bridged by the management decision to invest which can initiate or impede the innovation process. The basic problem is to close the 'development gap' which delays the transformation of research result from prototype to commercial-scale production.

To bring about this innovation process needs an alert and perceptive management, one that is appreciative of scientific developments and allows the scientific outlook to permeate all levels and not just the research department. Such an atmosphere is fostered by engaging scientists and engineers in the production, sales and management fields. It has been stated that one scientist in production or sales is equal to two in the research department.

A progressive management neither ignores scientific research, nor waits passively for scientists to announce their inventions. Instead, it actively seeks new technical improvements and innovations through the cultivation of contacts with men of science

and technology in academic and other research institutes. It also systematically searches current scientific literature for neglected ideas, either ready for use or capable of being made ready for use by effort.

To facilitate this kind of technical perception, there must be room at the top for high-level technical advisers to brief the management executive on implications of new scientific developments. The aim of an industrialist should be to establish and maintain technical pre-eminence in design, quality and production.

The importance of the technical adviser to assist the management in taking decisions to invest in innovations is widely recognised in the advanced countries. A survey has revealed that in the United States, one in every two small firms has a qualified technical adviser, although only 10 per cent of manufacturing firms operate their own research and development facilities. In Germany, the number of small firms with technical advisers is one in five, while in Britain it is one in six. In the transmission of scientific ideas to industry, the receptiveness of firms is as important as, perhaps more so than, methods of communication.

Innovation brings about the growth of industry in diverse ways. It may, for instance, fulfil a well-defined want of, say, some natural raw materials. In anticipation of the shortage of petroleum, processes were developed to obtain synthetic oil from coal. Alternatively, innovation may produce a new device or develop a new process to lower the cost of production or extend the use of products. Thus, the commercial synthesis of ammonia resulted in the mass production of fertilisers which revolutionised farming all over the world and improved the yield of agricultural products many times.

Innovation may lead to the creation of a new kind of want—an automobile, a refrigerator, a new kind of plastic, fabric or rubber, and so on. Also, it may solve problems of processes or products, perhaps anticipate and prevent these problems. At times, in addition to reducing the cost it improves efficiency in handling materials, processes, products and services. Just as it develops substitutes, it also finds new uses for existing materials.

Occasionally, it results in major breakthroughs that lead to the development of new industries as happened with the invention of transistors and computers.

Prompt utilisation of worthwhile results, particularly by small manufacturing firms, depends largely on effective liaison between the inventor and the innovator. Such liaison is a two-way pipeline; it disseminates latest technological developments to industry and takes the problems of industry to the scientists.

With all the developments in the media of communication, it has been found that there is no way of getting the message across better than the person-to-person method.

The value of word-of-mouth communication is demonstrated by the experience of the British Hosiery and Allied Trades Research Association which developed an instrument for use in factories. When it was first announced, only 5 per cent of the member-firms expressed interest in it, as judged by business-reply-paid-card response. But after liaison officers of the Research Association had visited and demonstrated the instrument in factories, 85 per cent of them ordered it.

Backwardness in firms, like poverty in people, is self-perpetuating. Often, it is due not to the absence of technical opportunities but the absence of able men in the top management hierarchy. To infuse a scientific spirit in these conservative firms, which are the rule rather than an exception, requires active liaison and enlistment of the support of scientific 'middlemen'. In Britain the co-operative research associations allocate, on an average, about 30 per cent of their annual outlay to liaison and information services. And these are regarded as inadequate.

It is neither essential nor desirable that all research be undertaken within industrial establishments. Often, manufacturing firms are too small to afford research departments. According to an estimate presented at the Federation of British Industries Conference in 1962, a minimum budget of an industrial research laboratory should be about Rs. 3 lakh a year. The cost per research scientist including those of his assistants and materials has been estimated between Rs. 50,000 and 80,000 per year.

More urgent than applied research institutes are development

research facilities which assist industrial units that lack scientific expertise to utilise technical inventions. The development cost is usually formidable. After a laboratory finding is proved, its further development in order to make it a commercial reality can cost, on an average, five to ten times the amount spent during its applied-research phase. Besides, the fatality rate of new ideas in the process of development is also high. Fifty to ninety per cent of them are discarded at this stage.

In many countries, manufacturing firms which are too small to set up their own research departments take advantage of the institutes which specialise in contract or sponsored research. The United States has many such institutions, some of them working on non-profit basis, having been established by private endowments. Two of the more prominent of the latter type institutes are the Mellon Institute for Industrial Research, founded in Pittsburgh in 1913, and the Battelle Memorial Institute in Columbus, Ohio.

In Germany, industry relies considerably on universities to tackle its problems. They are investigated by post-graduate science students and become the basis of their theses. The close liaison between German industry and universities is well illustrated by an example—a rather notorious one—of the I.G. Farben group which had ensured that no discovery of importance made in the chemical laboratories of the German universities was published without its prior intimation to the firm. In Germany, there are also the famed Max Planck Institutes, 42 of them, which work for industry.

In Britain, a plan for co-operative research associations for various industries was pioneered and has now grown into a sturdy institution. Other countries, including India, are adopting similar schemes. Besides, there are trade promotion associations which do research for extending the use of a particular commodity. In this category are those devoted to the promotion of nickel, copper, lead, zinc and petroleum.

In India, a sound base for industrial research has been laid with the establishment of national councils for agriculture, medicine and industry. One of the paradoxes of industrial research

in the country has been the apathy of industry in taking advantage of indigenous research facilities. Like two parallel lines, the two do not seem to meet ever. The result has been the growth of research in a virtual vacuum. It would be an over-simplification to suppose that the neglect of research by industries stems from their bias towards foreign collaboration.

The vital question, however, is whether the Government-sponsored research institutions are being used effectively to introduce to industrial firms technical innovations which may have escaped industry's notice. If not, it is worthwhile to find out what reforms in their structure would enable them to provide this essential service.

The root of the problem is that there has been neglect of advisory aid because of the over-emphasis on research. Through advisory aid, various industrial units can be reached and kept informed about current technological developments relevant to them. In the early phase of economic development of a country, this service is more rewarding than research and should take a priority. In India, such aid could be perhaps best channelled through the Small Industries Service Institute which already has a national organisation that looks after small manufacturing firms.

Government can actively promote technical innovations in industry through a systematic and widespread programme of research contracts and grants to various industries. There is greater scope for such contracts in India now, with the predictable upsurge in defence-oriented industries and the trend towards self-sufficiency.

Surprisingly, one country that can boast of a high degree of 'socialised' science is the United States. In America, 60 per cent of the total annual outlay for research in industry is provided by the Government. Out of an estimated 15.1 billion dollars (Rs. 7,000 crore) spent on research and development in 1964-65 in industry, about 9 billion dollars (Rs. 4,250 crore) were provided by the Government. Incidentally, the same proportion holds good for the total research in the U.S., estimated at about 21 billion dollars (Rs. 10,000 crore).

Besides direct stimulation of industrial research, Government

can accelerate technical changes through its fiscal and economic policies—taxation measures, state of competition, labour laws, monopoly agreements on markets, prices and trade terms, and tariff and import policy.

The price of technical stagnation is high. It not only checks further rise in the standard of living, but results actually in its further decline. Such a situation has been aptly described as “running up a descending escalator”.

While there can be no progress without scientists, scientists by themselves can hardly ensure technical progress. What is desirable for facilitating innovation in industry is the creation of a public attitude that will welcome—in fact, seek—technical changes, rather than wait passively for them to come on their own steam. In this sense, the American attitude towards novelty which has been criticised by some sociologists is not unwelcome. It motivates much research and is an incentive to innovation in industry.

